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Sport Fishery Abstracts

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Sport Fishery Abstracts

An abstracting service for fishery research and management

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of papers on limnology, ecology, natural history and other fields of specialization will be included when the subject has application to the conservation of sport fish and the restoration of sport fishing.

One volume consisting of not more than four numbers will be issued each year. Each number contains separate Author and Subject indexes, with the final number of each volume containing cumulative indexes. The last number of each volume contains a list of publications screened for appropriate material.

Suggestions for improving the usefulness and coverage of Sport Fishery Abstracts are solicited.

The Bureau of Sport Fisheries and Wildlife of the U. S. Fish and Wildlife Service assumes no responsibility for the accuracy of material from outside sources, and can only supply copies of articles written and published by the U. S. Fish and Wildlife Service. Requests for other articles should be sent to the author or publisher.

Prepared in the Branch of Federal Aid
S. E. Jorgensen, Chief
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5433. Mairs, Donald F., and Carl J. Sindermann (U. S. Bur. of Comm. Fish. Biol. Lab., Boothbay Harbor, Maine). 1962. A SEROLOGICAL COMPARISON OF FIVE SPECIES OF ATLANTIC CLUPEOID FISHES. The Biological Bulletin, Vol. 123, No. 2, pp. 330-343.

An investigation of the serological relationships of five species of clupeoid fishes was made by four methods: (a) photronreflectometer, (b) agar diffusion, (c) erythrocyte agglutination with absorbed antisera, and (d) paper electrophoresis.

Agar diffusion enabled qualitative differentiation of the species tested, while the photronreflectometer provided a quantitative measure of relative serological distances between species; results from the two methods were in good agreement.

On the basis of results obtained by the photronreflectometer and agar diffusion methods, the following species relationships are indicated: alewives and bluebacks are very closely related; shad lie quite close to alewives and bluebacks, but farther from them than alewives and bluebacks are from one another; menhaden and herring are further removed from the alewife-blueback-shad complex, with menhaden closer to it than herring; herring are comparatively remote from the other four species.

Generalized electrophoretic patterns were found for each clupeoid species. However, because of intraspecies variability, paper electrophoresis does not seem to be as useful a procedure for determining relationships of fishes as immunological methods. Species-specific patterns should be proposed only after large numbers of individuals representing both sexes have been sampled under different physiological conditions.

Absorptions of rabbit antisera with pooled erythrocytes of each of the five clupeoid species indicated that alewife and blueback were antigenically very similar; menhaden and shad were antigenically somewhat similar, although not as close as alewife and blueback. (Authors)

5434. Skinner, W. A., R. D. Mathews, and R. M. Parkhurst (Dept. of Pharmaceutical Chemistry, Stanford Research Inst., Menlo Park, California). 1962. ALARM REACTION OF THE TOP SMELT, ATHERINOPS AFFINIS (AYRES). Science, Vol. 138, No. 3541, pp. 681-682.

The "alarm" substance of the top smelt, Atherinops affinis (Ayres), has been isolated by extraction with methanol or ether from suffocated top smelt. These concentrated extracts, when introduced into an aquarium containing top smelt, induce a strong alarm reaction in the fish, characterized by rapid swimming, jumping, and often severe seizures. The fact that extracts from white surfperch, Phanerodon furcatus (Girard); surf smelt, Hypomesus pretiosus (Girard); northern anchovy, Engraulis mordox (Girard); or Pacific herring, Clupea pallasi (Valenciennes) caused only mild excitation in the top smelt indicated the species-specificity of the alarm reaction. (Authors)

5435. Qutob, Ziad (Lab. of Comparative Physiology, Univ. of Utrecht, Netherlands). 1962. THE SWIMBLADDER OF FISHES AS A PRESSURE RECEPTOR. Archives Néerlandaises de Zoologie, Vol. XV, No. 1, pp. 1-67.

The literature concerning pressure perception in fishes is extensively reviewed and points of contradiction are indicated. Perception of pressure change can be indirect (by exteroception) and direct (by proprioception). In the present investigation the part played by the swimbladder wall as a site of direct pressure perception is examined.

Three methods have been employed in the study of pressure perception: observation of spontaneous reactions; conditioning (training) on pressure changes; and electrophysiological recording of action potentials in the swimbladder nerve.

The problem of the site of pressure perception is discussed in general; it is concluded on the basis of the experimental evidence available that the swimbladder wall, the Weberian apparatus and exteroceptors all participate in pressure perception.

Finally, the following hypothesis is offered with regard to the functional relation between proprioception and exteroception as regulating mechanisms of the hydrostatic equilibrium in fishes: the swimbladder wall can only act as a pressure receptor as long as the pressure is changing, because otherwise adaptation prevails within a few seconds; exteroception on the other hand may also signal long-lasting pressure deviations causing hydrostatic disequilibrium. On this basis several apparent discrepancies in the results of previous authors can be explained. (Auth.)

5436. Klomp, H. (Zool. Lab., Agricultural Univ., Wageningen, Netherlands). 1962. THE INFLUENCE OF CLIMATE AND WEATHER ON THE MEAN DENSITY LEVEL, THE FLUCTUATIONS AND THE REGULATION OF ANIMAL POPULATIONS. Archives Néerlandaises de Zoologie, Vol. XV, No. 1, pp. 68-109.

The action of density related factors or processes is indispensable for the density regulation of animal populations, on the ground of the following considerations:

Without such processes no mechanism can account for the balance of reproductive and mortality rates. The evolutionary adjustment of reproduction and mortality by way of natural selection seems an impossibility, and denying the existence of a proximate density related system only leaves the possibility of an adjustment by chance. But this must be exceptional and can occur only in a small part of the species range.

In the above exceptional case of adjustment by chance the population will increase to infinity or become extinct if climate changes. Under constant climatical conditions the population is subject to a random dispersive process, and will sooner or later cross the relatively narrow density limits between which natural populations usually fluctuate. This leads eventually to the extinction of the population.

It has been shown in literature, that after the occurrence of a population low, induced for instance

by a very severe winter, the species normally recuperates the losses in a very short time. This proves the existence of reproductive excesses during some generations in succession. The increase in numbers stops when the density level characteristic for the species has been reached, and this shows that the reproductive and/or mortality rate must have been influenced by density. Then, reproduction and mortality are evenly balanced and this cannot be brought about by weather.

Without the operation of density related factors or processes different mean density levels in various parts of the species range cannot exist. Moreover, various mean density levels of different species in one habitat cannot be realized.

Consequently, the regulation of the density of animal populations by density independent weather factors as such is clearly an impossibility. If weather is involved in regulation it will only be in cooperation with other factors or processes, such as a constant number of hiding places, a density related physiological change of the organisms or, possibly, a genetic feed back mechanism. Only in cases where the physical milieu of the animals becomes less suitable with an increase of their density, "weather" acts as a responsive density regulating factor. (Auth.)

5437. Pfeiffer, Wolfgang (Dept. of Zool., Univ. of British Columbia, Vancouver, Canada). 1962. THE FRIGHT REACTION OF FISH. Biological Reviews, Vol. 37, No. 4, pp. 495-511.

The skin of some fishes contains a substance which, when released into the water, induces a characteristic fright reaction in other members of the same or related species.

This fright reaction is confined to members of the Ostariophysi and has been found in marine as well as freshwater representatives, in both schooling and non-schooling species.

The intensity of interspecific reactions to alarm substance shows a relation to the taxonomic positions of the different species.

The alarm substance is produced in specialized epidermal cells (Schreckstoffzellen), which do not open on to the surface but only release their contents when the skin is injured.

Alarm substance equivalent to 1/11 sq. mm. skin (about 0.002 mg.) is sufficient to drive a school of minnows from the feeding place in a 14 l. aquarium.

Reception is by way of the olfactory organ.

The fright reaction is innate and appears at a certain age regardless of prior experience. The reaction does not develop until some time after the alarm substance is formed in the skin.

The fright reaction may be visually transferred to individuals which have not been exposed to the alarm substance.

The fright reaction protects schools of very young fish from the cannibalistic attacks of the adults and protects the older fish from general predation. It may have played a profound role in the evolution of the Ostariophysi--the order containing most species of freshwater fish. (Auth.)

5438. Gulland, J. A., and G. R. Williamson (Fish. Res. Bd. of Canada, St. Johns, Newfoundland). 1962. TRANSATLANTIC JOURNEY OF A TAGGED COD. Nature, Vol. 195, No. 4844, p. 921.

An Atlantic cod tagged in central North Sea was caught on the Grand Banks.

5439. Hepher, B. (Fish Culture Res. Station, Dor, Israel). 1962. TEN YEARS OF RESEARCH IN FISH PONDS FERTILIZATION IN ISRAEL. I. THE EFFECT OF FERTILIZATION ON FISH YIELDS. Bamidgeh, Vol. 14, No. 2, pp. 29-38.

The effect of fertilizers on fish yield is apparent in ponds where fish were not fed as well as in ponds where fish were fed. The effect is greater in the former ponds, though it is noticeable in the latter too.

In ponds where fish-feed is added, fertilizers affect not only fish yield but also cause a better utilization of the added fish feed. This is probably caused by complementing and balancing the feed with natural food developed in the pond as a consequence of the fertilization.

Of the three main minerals commonly added as fertilizers - nitrogen, phosphorus and potassium, phosphorus is the most effective in fish ponds.

Nitrogen has a noteworthy effect on fish yield in ponds. This effect was noted in ponds where fish-feed was not added, mostly in spring and autumn, while in summer it was very small. The smaller effect of nitrogen in summer may be explained by the addition to the ponds of water with a high content of nitrogen, and the development of blue-green algae in the summer months.

Relatively high concentrations of potassium can be found in the water in most regions of Israel. It is therefore assumed that there is no need in potassium fertilization, though no direct experiments were yet carried out with these fertilizers. (Authors)

5440. Alexander, R. McN. (Dept. of Zool., Univ. College of North Wales, Bangor). 1961. THE STRUCTURE OF THE WEBERIAN APPARATUS IN THE CYPRINI. Proceedings of the Zoological Society of London, Vol. 139, Part 3, pp. 351-373.

The Weberian apparatus of a wide variety of fish of the division Cyprini has been examined. Particular attention has been paid to the soft parts. In all cases, the structure of the apparatus can easily be derived from that found in the primitive Characinoidei: the significance of the observed differences is discussed. Chranilov's theory of the mechanism of the apparatus in the Cyprinidae appears to be applicable to all Cyprini, including the highly modified Nemachilus. (Auth.)

5441. Thomas, J. D. (Dept. of Zool., Univ. of Ghana, Legon, Accra). 1962. THE FOOD AND GROWTH OF BROWN TROUT (SALMO TRUTTA L.) AND ITS FEEDING RELATIONSHIPS WITH THE SALMON PARR (SALMO SALAR L.) AND THE EEL (ANGUILLA ANGUILLA (L.)) IN THE RIVER TEIFY,

WEST WALES. The Journal of Animal Ecology, Vol. 31, No. 2, pp. 175-205.

The fish examined were captured at two stations on the River Teify, West Wales: station A in the area of a 'raised' bog, and station B characterized by a variety of water types.

The fauna was richer in number of species at station B than at A because of the wider range of habitats available at the former station. All the species in the fauna were classified as far as possible on a habitat basis.

The fish were captured by angling. At station B three species, Salmo trutta, S. salar and Anguilla anguilla were caught, but at station A only trout and eels were taken. No eels occurred in the samples taken from December to March.

A comparison of the dietaries of the three species shows dissimilarities in diet that can be attributed to differences in: (a) size-range and extent of gape, (b) selection mechanisms not attributable to size factors, (c) vertical stratification, (d) region of stream frequented, (e) seasonal activity.

There is a closer resemblance between the diets of salmon parr and trout of the same age. Mainly because of the benthic habits and winter hibernation of the eel there are appreciable differences between its diet and that of the salmonids.

Competition for food is possible between the two salmonid species in the Teify, but is unlikely to have any serious effect as it seems not to be expressed in the growth of the trout. (Auth.)

5442. McCormack, Jean C. (Freshwater Biol. Assn., Ambleside, England). 1962. THE FOOD OF YOUNG TROUT (SALMO TRUTTA) IN TWO DIFFERENT BECKS. The Journal of Animal Ecology, Vol. 31, No. 2, pp. 305-316.

This investigation was undertaken to study the food of trout fry (O-group) and yearlings (I-group) in natural conditions. It has shown that the very young trout fry do not require a special diet but eat the same food animals as older fry. Differences in diets between becks, seasons and ages have been shown but there still remains a wide gap in the knowledge required for true assessment of food in relation to fauna. Drift fauna, in particular, is a subject which must be studied in relation to the food of the young stages of trout and it would be valuable to know the amount and composition of the drift available and the proportion eaten by the trout fry. (Auth.)

5443. Alabaster, J. S., and W. G. Hartley (Ministry of Agriculture, Fisheries and Food, London, England). 1962. THE EFFICIENCY OF A DIRECT CURRENT ELECTRIC FISHING METHOD IN TROUT STREAMS. The Journal of Animal Ecology, Vol. 31, No. 2, pp. 385-388.

When collecting fish in a hand-net there was little difference in efficiency whether the operator went upstream or downstream, but the technique did appear to be better than collecting fish in the lower stop-net; at one station, efficiency was 28% compared with only 6% when collecting fish in the lower stop-net. The apparatus producing interrupted direct current was used on two occasions, and in spite of its smaller size and power output, its overall catching efficiency was found to be similar to that of the machine giving uninterrupted current. (Authors)

5444. Ogino, Chinkichi, and Setsuko Yasuda (Tokyo Univ. Fish., Shiba Kaigandori 6, Minato-ku, Tokyo, Japan). 1962. CHANGES IN INORGANIC CONSTITUENTS OF DEVELOPING RAINBOW TROUT EGGS. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 28, No. 8, pp. 788-791.

Changes in the contents of various minerals have been followed during the development of rainbow trout, Salmo gairdnerii irideus. The wet weight of 100 eggs increased after fertilization by absorbing water and then decreased gradually as development proceeded. After hatching, the wet weight increased rapidly. The percentages of dry sodium, potassium, silicon, calcium, and copper increased after hatching.

As an individual egg changes its wet weight during development, it is not correct to consider that the contents of various minerals expressed as percentages on dry basis indicate the exact changes taking place within the egg. Thus the changes in weights of minerals in 100 eggs were calculated. The contents of sodium, potassium, silicon, calcium, and copper increased after hatching. Sodium, potassium, and silicon increased greatly, whereas phosphorus showed little increase and magnesium decreased slightly in larval fish. (Authors)

5445. Nose, Yukio (Fish. Inst., Fac. of Agr., Univ. of Tokyo). 1962. ON THE TAGGED RATIO METHODS TO REMOVE THE BIAS OF ESTIMATE CAUSED BY TYPE C SYSTEMATIC ERRORS IN THE PETERSEN-TYPE TAGGING EXPERIMENT. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 28, No. 7, pp. 686-694.

In the Petersen-type tagging experiment, the type C systematic errors caused by the abnormal behavior of the tagged fish, gives bias to the estimate of fish population size.

The author introduces the tagged ratio methods to remove such a bias, under the following assumptions:

1. Type C systematic errors affect the vulnerability of the tagged fish during some intervals after the liberation.

2. The ratios of vulnerability of the tagged fish to that of untagged fish in these intervals are constant.

Some examples for calculation by these methods are shown. Results are compared using methods described previously. (Auth.)

5446. Yamada, Juami, Ryo Kikuchi (Tokai Reg. Fish. Res. Lab., Chuo-ku, Tokyo), Matajuro Matsushima, and Hirohisa Ogami. 1962. ON IMPROVING THE EFFICIENCY OF FEED FOR FISH CULTURE--II. DIGESTIBILITIES OF FEEDING-

STUFF FOR RAINBOW TROUT AND SOME TRIALS ON THE IMPROVEMENT. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 28, No. 9, pp. 905-908.

Digestibilities on various commercial feedstuffs for rainbow trout culture were tested by labeling the diets with P^{32} in the form of water-insoluble ammonium phospho-molybdate.

The poor digestibility of fish meal was not improved by rendering it into powder as fine as 300 mesh or by addition of commercial protease.

The good digestibility of dried mysis powder freshly prepared was greatly reduced by the addition of hot-water extracts of degenerated dried mysis. Therefore, one must be careful about the degeneration of feed during storage which causes a considerable loss in efficiency of materials.

The highest digestibility of fish soluble will naturally be ascribable to a high content of water soluble substances. (Authors)

5447. Thomson, J. M. 1962. TAGGING AND MARKING OF MARINE ANIMALS IN AUSTRALIA. C.S.I.R.O. Div. of Fish. and Oceanogr., Tech. Pap. No. 13, pp. 39; C.S.I.R.O. Abstracts, Vol. 10, No. 9, Abst. No. 771.

Twelve different tags or marks have been applied to 183, 113 aquatic animals (whales, fish, Crustacea, and shellfish) in Australian waters. Recoveries total 9918 (or 5.5 percent). The internal tag has given most satisfaction in those species which are cleaned before marketing. For medium or small fish sold in the round, the opercular tag is preferred, except in fish with soft opercles. Hydrostatic tags have been returned at a rate greater than normal fishing mortality; also, they and Petersen disks are not favored because of the wounds produced on a large proportion of fish. Petersen disks are known to work out of shark fins. The modified streamer tag with a plastic head is the most promising tag used on tuna. In crayfish, telson punches last over several moults but become more obscure with each ecdysis; the dart tag now being tested seems most promising. The most suitable tag may vary with age because of the different nature of the fishery operating on young and old age groups (e.g. Australian salmon).

Publicity has been provided by newspapers, periodicals, radio, printed notices, and personal contact. Incentive is provided by monetary reward.

5448. Cobb, Eugene S. (Tennessee Game & Fish Comm., Nashville). 1961. THE MANAGEMENT OF TENNESSEE FARM PONDS. Tennessee Game & Fish Commission, 33 pp.

Tennessee now has over 57,000 farm ponds. These total more than 26,000 acres of water and hundreds of new ponds are being constructed each year. These pond waters represent a valuable fishery resource, which if properly utilized, can bring quality fishing to virtually all fishermen in the state.

Tennessee ponds range from less than one-quarter acre to several hundred acres in size. The average pond is less than one-half acre and more than ninety percent are less than one acre.

Most ponds, regardless of size, are capable of producing fish of satisfactory size if certain management practices are followed. Since most pond failures can be traced to definite causes, this bulletin points out the most common mistakes which have been made in the past, in order that they can be avoided in the future.

It is the intent of this bulletin to present the basic factors involved in producing fish in farm ponds, whereby the pond owner can establish a program of management which will develop and maintain a balanced population of fish capable of producing quality fishing in the years ahead. (Auth.)

5449. Eipper, A. W., and H. A. Regier (Fernow Hall, Cornell Univ., Ithaca, New York). 1962. FISH MANAGEMENT IN NEW YORK FARM PONDS. Cornell Extension Bulletin 1089, 40 pp.

There are more than 18,000 farm ponds in New York State and new ones are being constructed at the rate of about 1,000 a year. Of the various farm-pond uses, fishing is one of the most popular because it provides recreation for the whole family, and the fish caught are a valuable addition to any meal.

The purpose of this publication is to discuss:

1. Factors to consider in deciding which fish species to stock.
2. Design and construction features particularly important in fish ponds.
3. Where and how to obtain fish for a farm pond.
4. Growth, survival, reproduction, and yield that can be expected from a farm fish pond in New York.
5. Management practices for obtaining satisfactory fishing from your pond.

Information presented here is based largely on results of 12 years' work on more than 150 ponds in Central New York State. The recommendations given should apply to farm ponds throughout New York that have surface areas up to two acres and maximum depths of seven to 15 feet. (Authors)

5450. Thomas, James C. (Calif. State Fish. Lab., Terminal Island). 1962. THE OCCURRENCE AND DISTINCTION OF THREADFIN SHAD IN SOUTHERN CALIFORNIA OCEAN WATERS. Calif. Fish and Game 48(4): 282-283.

The location of capture, San Pedro Bay, is the first record of threadfin shad, Dorosoma petenense (Gunther), occurring in southern California ocean waters. A field key and pictures are given to differentiate this species from thread herring, Opisthonema libertate (Gunther). (Auth.)

5451. Abramson, Norman J. (California State Fish. Lab., Terminal Island). 1962. ESTIMATING THE NUMBER OF ANGLING LICENSE PURCHASERS. California Fish and Game 48(4): 253-255.

An estimated 118,070 persons purchased 134,936 special California angling licenses in 1961.

The corresponding ratio of license purchasers to licenses is 0.875. The method of estimation involved examining a random sample of license stubs for persons purchasing more than one license. (Auth.)

5452. Joseph, David C. (California State Fish and Game Dept., Sacramento). 1962. GROWTH CHARACTERISTICS OF TWO SOUTHERN CALIFORNIA SURFFISHES, THE CALIFORNIA CORBINA AND THE SPOTFIN CROAKER, FAMILY SCIAENIDAE. California Dept. of Fish and Game, Fish Bulletin No. 119, 54 pp.

Growth characteristics, based on scale studies, were determined for the California corbina Menticirrhus undulatus and spotfin croaker Roncador stearnsi. In the corbina, standard lengths at ages I through VIII were 97, 210, 278, 323, 366, 386, 410, and 421 mm. Spotfin lengths at ages I through X were 97, 197, 269, 312, 345, 367, 394, 422, 442, and 453 mm. In both species, annual growth commenced in April and was completed in December, with most rapid growth occurring in the period of July through September. In I and II year fish, positive correlation was demonstrated between total annual growth and average summer water temperatures. Food selection by growing corbina progressed from mysids and amphipods to clam siphon tips to sand crabs, Emerita analoga. Young spotfin similarly fed on mysids and amphipods. Older fish, however, showed a more heterogenous diet of invertebrates than did corbina. (Auth.)

5453. Ebert, Earl E., and Charles H. Turner (California State Fish. Lab., Terminal Island). 1962. THE NESTING BEHAVIOR, EGGS AND LARVAE OF THE BLUESPOT GOBY. California Fish and Game 48(4): 249-252.

The typical nests, eggs and newly-hatched larvae are described. In one nest there were a calculated 1,700 eggs. The spawning season off southern California was recorded as April through October. The occurrence of fossil Coryphopterus is mentioned, as is its bathymetric range. (Authors)

5454. Turner, Charles H., and Earl E. Ebert (California State Fish. Lab., Terminal Island). 1962. THE NESTING OF CHROMIS PUNCTIPINNIS (COOPER) AND A DESCRIPTION OF THEIR EGGS AND LARVAE. California Fish and Game 48(4): 243-248.

The typical nest, eggs, newly-hatched larvae, and nesting behavior are described. In one nest there were a calculated 615,000 eggs; probably the result of spawning by several females. Breeding occurs during summer and fall. (Authors)

5455. Waldichuk, Michael (Fish. Res. Bd. of Canada, Biol. Sta., Nanaimo, B. C.). 1962. SOME WATER POLLUTION PROBLEMS CONNECTED WITH THE DISPOSAL OF PULP MILL WASTES. The Canadian Fish Culturist, Issue 31, pp. 3-34.

Pulp mill wastes in coastal British Columbia have produced a wide range of conditions in the recipient waters. The ultimate pollution which develops in a pulp mill area depends on the extent of recovery of the dissolved organic materials and suspended substances in the wastes and on the type of oceanographic system into which the wastes discharge. Raw wastes from a high-dissolving grade, cellulose sulphite pulp mill in the Prince Rupert area and a poorly flushed, partially-enclosed embayment system into which they discharge, combine to produce the most severe marine pollution yet encountered in British Columbia.

The proper selection of a mill site in an area where waters are turbulent and provide a large flow on each tide can do much to prevent intolerable pollution.

Inlets will always be suited economically for pulp mills because of the availability of resources and transportation. Not all inlets, however, are suited for waste disposal.

A large runoff provides a good flushing medium for waste discharged into surface water. In areas where such runoff is not available, it may be possible to utilize deep saline water for immediate dilution. This can be achieved with proper design of a submarine outfall terminating in a diffuser.

Long-term effects of pulp mills cannot be easily recognized and may be more serious than immediate effects that can be readily identified and corrected. This chronic pollution results mainly from cumulative developments arising out of waste discharge. In the sea, as in fresh water, deposition of particulate materials modifies the environment for bottom-living organisms which may be important sources of food for fish or humans. (Auth.)

5456. Tarzwell, Clarence M. (Robt. A. Taft Sanit. Eng. Center, U. S. Pub. Health Serv., Cincinnati, Ohio). 1962. THE NEED AND VALUE OF WATER QUALITY CRITERIA WITH SPECIAL REFERENCE TO AQUATIC LIFE. The Canadian Fish Culturist, Issue 31, pp. 35-41.

Water is one of our most important basic resources. It is now generally recognized that our fresh-water supplies are definitely limited, that they cannot be increased effectively by any known economically-feasible method, that water shortages will develop in the future, and that we must reuse our water extensively if our supplies are to meet future demands. Effective reuse of water requires definite knowledge of the quality of water required for each use and adequate water quality criteria to insure such quality. Water quality criteria for the protection of aquatic life are urgently needed since water pollution is a principal cause of unfavorable environmental conditions in our fresh, marine, and estuarial waters. Pollution control is a necessity and must be given the highest priority if we are to restore, maintain and develop our aquatic resources. The first step in the program is research to determine the environmental conditions which are required for the survival, growth, reproduction, and general well-being of the important members of the aquatic biota. A knowledge of these requirements

is basic to the setting of water quality criteria to insure their continued well-being.

In setting water quality criteria it is the extremes of environmental conditions that must be delineated because they determine the survival of an organism and the suitability of an environment. For the production of adequate crops the ranges of most favorable conditions should be defined also. While criteria are needed to indicate safe levels for short exposure periods, stress should be laid on the determination of the levels of conditions which are not harmful under conditions of continuous exposure and which are conducive to the survival of the species. Criteria also are essential for maintaining conditions favorable to the organisms in the food chain. (Auth.)

5457. MacEachern, N. E. J., and J. R. MacDonald (Fish Culture Br., Dept. of Fish. of Canada, Halifax, N. S.). 1962. THE SALMON FISHERY IN NOVA SCOTIA. The Canadian Fish Culturist, Issue 31, pp. 43-57.

The history of Atlantic salmon fishing in the province, both rod and commercial is summarized.

The salmon streams in the province are listed along with their estimated average annual catch.

Also listed are the salmon rivers which in the opinion of the Department have been destroyed or seriously affected as salmon streams by virtue of hydro development. The probable effect on both rod and commercial fishing in relation thereto, especially the commercial fishing in the estuary, is discussed.

The effects of future reasonable conservation measures and the cost of such measures are estimated. (Authors)

5458. Fry, Donald H., Jr. (Marine Resources Br., California Dept. of Fish and Game, Sacramento). 1962. POTENTIAL PROFITS IN THE CALIFORNIA SALMON FISHERY. Calif. Fish and Game, Vol. 48, No. 4, pp. 256-267.

The net-economic-yield concept is not applicable to a fishery in which everyone can participate and in which efficient methods are outlawed to prevent overfishing. The concept could be applied, however, in a fishery managed for maximum efficiency. The profits that would accrue from such a fishery are calculated.

The troll fishery, now the only legal way to take commercial salmon in California, is very inefficient. Several other fishing methods are briefly considered and costs are calculated for operating a hypothetical gill-net fleet in the Sacramento-San Joaquin Delta. (It is not proposed that gill netting be legalized--the study is strictly for calculating profits.)

In such a hypothetical fishery all trolling would be stopped, all fishing for Sacramento-San Joaquin salmon would be in the Delta. Similar fisheries could be established in other rivers.

The historical gill-net fishery was outlawed in 1957 after its efficiency had been reduced by overcrowding, closed seasons, and closed areas. It could take only those fish which escaped the trollers.

The harvest in the Delta could be at least as large as the total ocean salmon catch off California because landings of Sacramento-San Joaquin salmon presently made off Oregon, Washington, and Canada exceed catches made off California of salmon from all other rivers. California's 7,895,000-pound average annual catch (1952-1961) was used as the normal catch of the hypothetical gill-net fleet.

The probable monthly distribution of the catch was determined from gill-net catch records and from some experimental fishing during the closed season.

The largest gill-net catch for which we have detailed records was made in 1946 when 6,463,000 pounds of salmon were taken. The season closed September 26 when fishing was at its peak. In September, 219 boats were fishing, including a number of unsuccessful ones. The fishing grounds were seriously overcrowded and the fishermen were using linen gill nets which were pulled by hand. By doing away with lengthy closed seasons and by using nylon or monofilament nets (which have been proven much more effective) and mechanical net pullers, a fleet of 50 boats manned by good fishermen could land the same poundage. The 50 boats would be needed only during the peak months of September and October.

The cost of purchasing, maintaining and operating such a fleet would be about $323,000 per year, including $20 per day for time spent by each fisherman either while fishing or doing maintenance work.

The gross income at 1959 prices, about $3,324,000 per year, would yield a net profit of over $3,000,000 which is the equivalent of 38 cents per pound or $8.45 per fish landed.

Thus, 38 cents per pound or $8.45 per fish would be a justifiable amount to allow when calculating net benefits to the commercial salmon fishery that would result from enhancing existing runs or establishing new ones.

Values of the sport catch are not included in these determinations. (Auth.)

5459. Muncy, Robert J. (School of Forestry and Wildl. Mgmt., Louisiana State Univ., Baton Rouge). 1962. LIFE HISTORY OF THE YELLOW PERCH, PERCA FLAVESCENS, IN ESTUARINE WATERS OF SEVERN RIVER, A TRIBUTARY OF CHESAPEAKE BAY, MARYLAND. Chesapeake Science, Vol. 3, No. 3, pp. 143-159.

A detailed study on the life history of yellow perch in the Severn River was conducted during 1958. Additional data were collected during 1959, 1960 and 1961 on tag returns and during 1959 on growth of young-of-the-year yellow perch.

Spawning took place in March and was restricted to fresh and brackish water areas of the upper Severn River and Run, where salinities were below 2 0/00. Some egg strands were also found in isolated coves downstream in years of high precipitation. Males arrived on the spawning grounds prior to the females; males remained on these areas over longer periods. The size composition of spawning stock was fairly constant throughout the spawning period. There was

a direct relationship between the number of eggs produced and the size of the female. Hatching success of eggs was adversely affected by salinity and silt.

Adult yellow perch marked on the Severn River spawning grounds remained within the system. Marked fish dispersed over the river system during the summer months. In the fall, tags were recovered in the upper half of the Severn River, an area with salinities from fresh water to 7 0/00, but females were caught in greatest numbers farther downstream. Nylon streamer tags were returned for two years, but Petersen disk tag returns were spread over a four-year period. Angler harvest was 11 percent for 1958, 2 percent for 1959, and 1 percent for 1960 and 0.1 percent for 1961 or a total 13.9 percent of the 1261 yellow perch tagged. Comparison of the size classes of recaptured fish against the numbers tagged in that size class revealed no angler selectivity.

Food habits of young-of-the-year yellow perch were similar to those of the same species in freshwater habitat. Growth rates of estuarine yellow perch were greater than that recorded for most freshwater habitats but were variable between year classes. Five adult yellow perch tagged in 1955 and 1956 provided checks on the validity of annuli as age indicators; annuli were present for each year following marking.

Abundance of young-of-the-year yellow perch in the Severn River appeared to be related to the commercial catch in the upper Chesapeake Bay three and four years later and to the spawning run in the Severn River four years later. (Auth.)

5460. Hoese, H. Dickson (Inst. of Marine Science, Univ. of Texas, Port Aransas). 1962. SHARKS AND RAYS OF VIRGINIA'S SEASIDE BAYS. Chesapeake Science, Vol. 3, No. 3, pp. 166-172.

Seven sharks (Carcharias taurus, Mustelus canis, Negaprion brevirostris, Carcharhinus milberti, Sphyrna zygaena, Squalus acanthias, and Squatina dumerili) and six batoids (Raja eglanteria, Dasyatis centroura, D. sayi, Gymnura altavela, G. micrura, and Rhinoptera bonasus) are reported from the Seaside of the Eastern Shore of Virginia. Mustelus canis may be the most common Seaside shark, but young Carcharhinus milberti are common enough to support a small commercial fishery, and the remainder of the species are not uncommon. Negaprion brevirostris is reported for the first time from Virginia; four males taken from the Wachapreague area in 1961. Deep channels and lack of a salinity barrier may explain what seems to be a rich Seaside elasmobranch fauna. The shark fauna seems more closely related to the outer coasts of Maryland, Delaware, and New Jersey than to Chesapeake Bay, although more collections in the lower bay are needed. (Auth.)

5461. Mansueti, Romeo J. (Chesapeake Biol. Lab., Solomons, Maryland). 1962. EGGS, LARVAE, AND YOUNG OF THE HICKORY SHAD, ALOSA MEDIOCRIS, WITH COMMENTS ON ITS ECOLOGY IN THE ESTUARY. Chesapeake Science, Vol. 3, No. 3, pp. 173-205.

The problem of whether the anadromous Alosa mediocris spawns in fresh water or at sea is clarified; eggs stripped from brood fish taken during May 1956 in tidal fresh water in the Patuxent River, Maryland, were hatched successfully in fresh water. Unknown eggs and larvae taken in plankton samples at the same site in 1953 where adults are abundant were also believed to be this species.

Data and illustrations of the eggs and early larval stages of this species are presented for the first time. Very young transforming stages between 9-20 mm are tentatively identified from upper tidewater plankton collections. Some juvenile A. mediocris, taken by beach seine and trawls, are treated in detail. All are compared briefly with closely related clupeoids found under similar ecological conditions. (Auth.)

5462. Anonymous. 1962. POLLUTION-CAUSED FISH KILLS, JANUARY-JUNE 1962. U. S. Department of Health, Education, and Welfare, Public Health Service, 4 pp.

This report presents a listing of pollution-caused fish kills as submitted to the U. S. Public Health Service for the first six months of 1962. These notifications were received under a cooperative arrangement with health and conservation agencies of the fifty States. The 143 reports shown here include all notifications of fish kills occurring in 1962 that have been received as of June 30.

5463. Ridgway, George J., George W. Klontz, and Charles Matsumoto (Biol. Lab., Bur. of Comm. Fish., Seattle, Washington). 1962. INTRASPECIFIC DIFFERENCES IN SERUM ANTIGENS OF RED SALMON DEMONSTRATED BY IMMUNOCHEMICAL METHODS. International North Pacific Fisheries Commission, Bulletin No. 8, pp. 1-13.

The sera of most Alaskan red salmon Oncorhynchus nerka Walbaum were found to contain at least 14 antigenic components when tested by the double diffusion precipitin analysis method of Ouchterlony with antisera prepared in rabbits. Two of these components, designated antigens I and II, were missing from 116 of 126 blood samples from red salmon taken in Asian waters. In contrast, only 31 of 905 blood samples from red salmon of American origin lacked these components. Intermediate frequencies of occurrence of these antigenic components were found in blood samples from red salmon caught in the central North Pacific and Bering Sea. The results are considered indicative of the intermingling of Asian and American stocks of red salmon in these areas.

An additional antigen (or antigens) was found which occurs in the sera of only mature or maturing female red salmon. (Authors)

5464. Fukuhara, Francis M., Sueto Murai, John J. LaLanne, and Arporna Sribhibhadh (Biol. Lab., Bur. of Comm. Fish., Seattle, Washington). 1962. CONTINENTAL ORIGIN OF RED SALMON AS

DETERMINED FROM MORPHOLOGICAL CHARACTERS. International North Pacific Fisheries Commission, Bulletin No. 8, pp. 15-109.

In a comparative study of the morphology of populations of red salmon Oncorhynchus nerka from Asia and North America started in 1955, reference samples were collected from all principal red salmon streams and fisheries of North America. Samples of red salmon of Asian origin were obtained from the Okhotsk Sea near the southwest coast of the Kamchatka Peninsula. Samples to be identified as native to Asia or North America were obtained from the North Pacific Ocean and Bering Sea. Seven meristic characters showed promise as useful indices of continental origin and were unaffected by intra-area sources of variation.

On the basis of supplementary biological evidence, we classified high-seas samples as being of western Alaska or southwestern Kamchatka origin, using the discriminant function analysis. Western Alaska red salmon dominated most samples taken in 1956 eastward from longitude 175° E; southwestern Kamchatka red salmon dominated westward from that longitude. Appreciable quantities of western Alaska red salmon occurred as far west as longitude 170° E and appreciable quantities of southwestern Kamchatka red salmon appeared to occur as far east as 175° W, south of the Aleutian Islands. In May and June of 1957, western Alaskan red salmon dominated east of 180° and southwestern Kamchatka red salmon dominated as far eastward as longitude 175° E. (Authors)

5465. Smitherman, R. Oneal, and R. Eugene Hester (Agri. Experiment Sta., North Carolina State College, Raleigh, N. C.). 1962. ARTIFICIAL PROPAGATION OF SUNFISHES, WITH MERISTIC COMPARISONS OF THREE SPECIES OF LEPOMIS AND FIVE OF THEIR HYBRIDS. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 333-341.

All possible crosses among three species of sunfishes--the bluegill, Lepomis macrochirus Rafinesque; the redear, Lepomis microlophus (Gunther); and the redbreast, Lepomis auritus (Linnaeus)--were successfully produced. One cross, female redbreast X male bluegill, was made by placing one adult of each species in a plastic pool and allowing them to spawn. The five remaining crosses were produced two to nine times each by stripping and artificial insemination.

Progeny from five of the six possible crosses were stocked in plastic and/or concrete pools and allowed to grow for approximately 2 months. Samples from each cross were examined, and 10 meristic counts were recorded for each fish. Corresponding counts were made on samples from each parent species. The data provide characterizations of parent species and their hybrids as well as comparisons among them.

The comparisons showed that hybrids were generally intermediate between their parent species in most taxonomic characters. A blending or multiple allelic inheritance rather than simple Mendelian inheritance was indicated in the determination of these characters.

Other sunfish crosses were successfully made, but the progeny were not reared. The fertility of hybrid males from the F_1 cross of female bluegill X male redbreast was established in crosses with female green sunfish, Lepomis cyanellus Rafinesque, female bluegill, and female redear. Reciprocal crosses between the green sunfish and redear were made. Female green sunfish were also successfully crossed with a male redbreast and with a male bluegill. (Authors)

5466. Applegate, Vernon C. (U. S. Bur. of Comm. Fish., Ann Arbor, Michigan), and Everett L. King, Jr. 1962. COMPARATIVE TOXICITY OF 3-TRIFLUORMETHYL-4-NITROPHENOL (TFM) TO LARVAL LAMPREYS AND ELEVEN SPECIES OF FISHES. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 342-345.

The tolerances of larval lampreys, rainbow trout, and 10 species of warmwater fishes to 3-trifluormethyl-4-nitrophenol (TFM), a selective lamprey larvicide, were determined in three dilution waters of different physical and chemical characteristics. Differential toxic effects of the chemical to larval lampreys and test fishes varied broadly with the species of fish. Smallmouth bass and other centrarchids were most tolerant of the chemical; walleye, yellow perch, bullheads, and white suckers were most susceptible. The toxicity of TFM to both lampreys and fishes diminished as the conductivity and alkalinity of the dilution water increased. The differential action of the chemical was retained in all waters, however. (Authors)

5467. Fajen, Otto F. (Missouri Cons. Comm., Columbia). 1962. THE INFLUENCE OF STREAM STABILITY ON HOMING BEHAVIOR OF TWO SMALLMOUTH BASS POPULATIONS. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 346-349.

The homing behavior of smallmouth bass was studied in two small Ozark streams; Big Buffalo Creek with relatively permanent pools, and Little Saline Creek with many unstable pools continually altered by the shift of chert gravel. The smallmouth bass in both streams normally restrict their movements to limited sections of the streams, usually one distinct pool.

In Little Saline Creek, 39 of 97 tagged bass recaptured had deserted their home pools. Of these, 24 were forced to move because their home pools had been eliminated by deposition of chert gravel. It was concluded that the movement of smallmouth bass in Little Saline Creek was directly correlated with the physical stability of the stream.

The bass of Big Buffalo Creek moved somewhat more frequently than the bass in the stable pools of Little Saline Creek although the pools of Big Buffalo Creek were comparatively stable during the study period. Fifteen bass made voluntary trips of 100 to 2,845 feet to other pools, and later returned to their home pools. Such voluntary straying and

homing behavior has not been reported before for warmwater fish. (Auth.)

5468. Crowe, Walter R. (Inst. for Fish. Res., Michigan Dept. of Cons., Ann Arbor). 1962. HOMING BEHAVIOR IN WALLEYES. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 350-354.

Records obtained from the Muskegon River system, the Inland Waterway, and Bay de Noc in northern Lake Michigan indicate that walleyes return to the same spawning areas year after year. Walleyes were tagged and released during the spawning period at several locations. Where netting was repeated in subsequent years many tagged walleyes were recaptured at the locations where they were tagged previously. Walleyes which were tagged and released at sites where netting was not repeated were not recaptured at other locations. The return of tagged walleyes to areas where they had been in previous seasons and the scarcity of tagged walleyes from other areas provide strong evidence for homing behavior by this species. (Auth.)

5469. Olson, Donald E., and Warren J. Scidmore (Minnesota Dept. of Cons., St. Paul). 1962. HOMING BEHAVIOR OF SPAWNING WALLEYES. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 355-361.

Study of marked adult walleyes returning to a spawning site in Many Point Lake, northern Minnesota, showed evidence of homing behavior rather than a strictly random return in successive years. The homing behavior, however, was not shown by the majority of the fish, and among those which evinced homing behavior the pattern of return was irregular. Possible causes of variation in homing in different years and circumstances which could produce an apparent homing effect are discussed. (Authors)

5470. Regier, Henry A. (Dept. of Cons., Cornell Univ., Ithaca, New York). 1962. VALIDATION OF THE SCALE METHOD FOR ESTIMATING AGE AND GROWTH OF BLUEGILLS. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 362-374.

Bluegill age and growth data were obtained from 24 small farm ponds near Ithaca, New York. Criteria for annulus recognition were developed from scales of known-age bluegills which consisted of original stock in the ponds. Twelve separate criteria permitted recognition of annuli in nearly all samples.

The 24 body-scale relationships estimated in the present study were compared with 18 relationships determined by 10 other authors after units of measurement had been standardized. Body-scale relationships were found to be approximately rectilinear for the key-scale area used in this study except for bluegills below 1.5 inches. The hypothesis that differences between intercepts (i.e., correction factors) were due only to chance variation was tested and rejected. From a practical standpoint, however, inaccuracies resulting from use of an average intercept were found to be negligible.

Bluegills occasionally fail to form annuli near the focus or at the margin. Validity of annulus determination and back-calculation were examined by comparing back-calculated lengths with observed lengths in previous years for each of 24 populations. Poor agreement was found in segments of four populations, and acceptable agreement otherwise.

The scale method, as applied in this study, was generally valid for age and growth determinations of bluegills. (Auth.)

5471. Tabb, Durbin C., and Albert C. Jones (Inst. of Marine Sci., Univ. of Miami, Coral Gables, Florida). 1962. EFFECT OF HURRICANE DONNA ON THE AQUATIC FAUNA OF NORTH FLORIDA BAY. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 375-378.

A hurricane caused heavy mortality among aquatic animals in North Florida Bay in September 1960. Fish and invertebrates were stranded by retreating salt water which had been driven inland, or were killed by mud suffocation or turbulence. Oxygen depletion due to decomposition or organic material caused subsequent mortality. Salinities returned to normal within 6 weeks, but dissolved oxygen concentrations remained abnormally low for a longer period. Fish and invertebrates were scarce for several months in the areas of greatest oxygen depletion. When environmental conditions again became suitable, the stricken areas were recolonized from surrounding regions. Sport-fish catches in the area declined immediately after the storm, but recovered within one to several months, depending on the locality. Catch statistics indicate that after the storm juvenile pink shrimp moved from their estuarine nursery grounds into deeper water about 60 miles offshore, where they were caught by the fishery. There is no evidence that the aquatic fauna of the area suffered any permanent damage. (Authors)

5472. Croker, Robert A. (U. S. Bur. of Comm. Fish., Biol. Lab., Gulf Breeze, Florida). 1962. GROWTH AND FOOD OF THE GRAY SNAPPER, LUTJANUS GRISEUS, IN EVERGLADES NATIONAL PARK. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 379-383.

A study of the biology of the gray snapper was based on the examination of 849 fish collected primarily from the sport fishery of Everglades National Park. Gray snappers from Park waters ranged from 1 to 5 years of age, with age-groups II and III making up 62 and 29 percent of the catch. Mean lengths for each age group, age and length at recruitment into the sport fishery, length-weight relationship, and sex ratio of gray snapper are given. All Everglades Park fish were immature.

The stomachs of 200 fish were examined for food contents. Crustaceans made up 61.6 percent of food items by number and 76.7 percent by volume, shrimp occurring most frequently. Fish and crabs occurred in 34 and 27 percent of the stomachs

containing food. (Auth.)

5473. Wagner, Wilbert C., and Thomas M. Stauffer (Inst. of Fish. Res., Michigan Dept. of Cons., Marquette). 1962. SEA LAMPREY LARVAE IN LENTIC ENVIRONMENTS. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 384-387.

Surveys were conducted at 29 locations in the Lake Superior, Lake Michigan, and Lake Huron drainages to determine if larval sea lamprey, Petromyzon marinus, inhabit lentic waters. A direct-current shocker and a dredge were used to take samples near the mouths of streams that produce sea lampreys. In the Great Lakes proper, 26 larvae were taken from 10 of the 22 areas that were surveyed. In small lakes tributary to the Great Lakes, 113 larvae were taken from 3 of the 7 lakes studied. Nearly all larvae were collected within 1/4 mile of the mouth of a stream containing larvae, usually from silty-sand substrate in areas protected from severe wave action. Aquatic vegetation and bottom-dwelling animals were usually present at locations where larvae were collected. (Authors)

5474. Iversen, E. S., and Alan W. Moffett (Inst. of Marine Science, 1 Rickenbacker Causeway, Miami 49, Florida). 1962. ESTIMATION OF ABUNDANCE AND MORTALITY OF A SPOTTED SEATROUT POPULATION. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 395-398.

Population abundance and mortality rates of the spotted seatrout (Cynoscion nebulosus) in the vicinity of Pine Island, Florida, were studied using internal anchor tags. Five thousand four hundred nine fish were tagged during the period January 6 through 20, 1961. From January 21 through May 31, 1961, recoveries totaled 1,349 (24.9 percent). The total weight of the adult population as of January 21 was estimated by the Petersen method at 973,000 pounds, and the range was from 832,000 to 1,172,000 pounds at the 95-percent confidence level. Total mortality was divided into fishing mortality and other losses, with a ratio of about 1 to 5. Other losses consisted mainly of natural mortality, slight losses by emigration, and loss of tags. (Authors)

5475. Meehan, William R., and Donald B. Siniff (Alaska Dept. of Fish and Game, Juneau). 1962. A STUDY OF THE DOWNSTREAM MIGRATIONS OF ANADROMOUS FISHES IN THE TAKU RIVER, ALASKA. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 399-407.

A modified scoop trap was designed and constructed to sample downstream-migrant juvenile salmon in the Taku River, a turbid river in southeastern Alaska. A sampling program was designed to determine the behavior of these migrants with respect to their seasonal and daily timing, the size and age composition of the various species, and the correlation between certain of these biological measurements and the physical characteristics of the environment. The length-weight relationships and condition factors of chinook, coho, and sockeye smolts were determined; differences in these relationships by week and by time of day are discussed. (Authors)

5476. Latta, William C. (Pigeon River Trout Res. Sta., Michigan Dept. of Cons., Vanderbilt). 1962. PERIODICITY OF MORTALITY OF BROOK TROUT DURING FIRST SUMMER OF LIFE. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 408-411.

Little is known about the periodicity of mortality of brook trout (Salvelinus fontinalis) between the egg stage at midwinter and the fingerling stage the following fall. In a 300-yard (0.77-acre) section of the Pigeon River, Otsego County, Michigan, the average instantaneous mortality rate of young brook trout was computed to be 0.02419 per day from emergence in March to June 26, 0.00691 per day from June 26 to July 24, and 0.00519 per day from July 24 to September 19, 1961. (Auth.)

5477. Meyer, William H. (Iowa Cooperative Fish. Res. Unit, Iowa State Univ. of Sci. and Tech., Ames). 1962. LIFE HISTORY OF THREE SPECIES OF REDHORSE (MOXOSTOMA) IN THE DES MOINES RIVER, IOWA. Transactions of the American Fisheries Society, Vol. 91, No. 4, pp. 412-419.

Life histories of the golden redhorse (Moxostoma erythrurum), northern redhorse (M. macrolepidotum), and silver redhorse (M. anisurum) were studied on the Des Moines River in central Iowa. Adult golden redhorse are widely distributed within the study area; silver redhorse and young golden redhorse are primarily in areas where the current is slower; northern redhorse are generally present in fast-moving water. Redhorse populations are sedentary in the summer as judged from the movements of 1,642 fin-clipped redhorses.

Length conversion factors and body-scale relationships are given for each species. Weight increased as the total length raised to the 3.0207 power in northern, 3.0980 power in golden, and 3.1243 power in silver redhorse. Coefficients of condition (C_{TL}) averaged 36.0 for northern, 38.9 for golden, and 40.4 for silver redhorse, but showed definite seasonal trends with lows following spawning and increases during the summer and fall. There appeared to be no reason to doubt the validity of the annuli as year marks. Age was determined for 487 golden redhorse, 319 northern redhorse, and 196 silver redhorse.

The primary foods of the redhorses, in their order of abundance, are immature chironomids, immature Ephemeroptera, and immature Trichoptera. Silver redhorse do not mature until age V; most northern and some golden redhorse mature at age III. Total length and number of eggs per female were linear. (Auth.)

5478. McNulty, J. Kneeland, Robert C. Work, and Hilary B. Moore (Inst. of Marine Sci., Univ. of Miami, Florida). 1962. SOME RELATIONSHIPS BETWEEN THE INFAUNA OF THE LEVEL BOTTOM

AND THE SEDIMENT IN SOUTH FLORIDA. Bulletin of Marine Science of the Gulf and Caribbean, Vol. 12, No. 3, pp. 322-332.

A study of the level bottom communities of South Florida in relation to the coarseness of the sediment has led to certain generalizations. Detritus feeders predominate in the finest sediments, and deposit and filter feeders at intermediate grades, but the latter are most abundant at a considerably greater particle size than that found by Sanders in Buzzards Bay. From a comparison of a number of selected communities, there is a very close correlation between the body size of the deposit feeders and the particle size, regardless of the type of animal concerned. (Authors)

5479. Armitage, Kenneth B., and Leonard J. Olund (Dept. of Zool., The Univ. of Kansas, Lawrence). 1962. SALT TOLERANCE OF THE BROOK STICKLEBACK. The American Midland Naturalist, Vol. 68, No. 2, pp. 274-277.

Oxygen consumption of Eucalia inconstans (Kirtland) was essentially identical in fresh water and 10% sea water, increased in 20% sea water and decreased progressively at all higher concentrations. Activity was normal in 10% and 20% sea water and decreased progressively at each higher concentration; all animals died in 60% sea water. The fresh-water distribution of the brook stickleback appears to result from a physiological inability to cope with the stress of increased salinity. (Authors)

5480. Weisel, George F. (Dept. of Zool., Univ. of Montana, Missoula). 1962. COMPARATIVE STUDY OF THE DIGESTIVE TRACT OF A SUCKER, CATOSTOMUS CATOSTOMUS, AND A PREDACEOUS MINNOW, PTYCHOCHEILUS OREGONENSE. The American Midland Naturalist, Vol. 68, No. 2, pp. 334-346.

Ptychocheilus oregonense is a cyprinid which has undergone adaptations from its assumed bottom-dwelling ancestors to acquire a predaceous role. When compared to the related Catostomus catostomus which is a bottom-dwelling species with suctorial ingestion, the adaptations of Ptychocheilus are: a large, terminal mouth and streamlined body; reduced number of taste buds; large eye; reduced pharyngeal pad, serving as a biting pad rather than part of a straining apparatus; development of a few, large pharyngeal teeth rather than a series of comb-like teeth; increased diameter of the first limb of the intestine to compensate for lack of a stomach; decreased length of intestine; lack of a stratum compactum in the submucosa of the intestine; and an increased muscularis externa. The large eye, terminal mouth, small pharyngeal pad, and short intestinal tract are conditions found in the larval catostomids. This similarity to larval catostomids coupled with the absence of teeth and a stomach indicate that cyprinids arose from a form similar to modern suckers. The gross and microscopic anatomy of the digestive tract of both species is described. (Auth.)

5481. Schwartz, Frank J., and Ben W. Dutcher (Chesapeake Biol. Lab., Solomons, Maryland). 1962. TOOTH REPLACEMENT AND FOOD OF THE CYPRINID NOTROPIS CERASINUS FROM THE ROANOKE RIVER, VIRGINIA. The American Midland Naturalist, Vol. 68, No. 2, pp. 369-375.

Examination of 504 pairs of pharyngeal arches of the cyprinid Notropis cerasinus collected monthly from the Roanoke River near Shawsville, Virginia, June 1955-May 1957, revealed a constant 3-1-2-4 pattern of tooth replacement. This pattern remained unchanged throughout the seasons. The primary food items found in the stomachs of 578 specimens were chironomids, simuliids, trichopterids and coleopterids. (Authors)

5482. Fisher, Herbert J. (Missouri Cons. Comm., Jefferson City). 1962. SOME FISHES OF THE LOWER MISSOURI RIVER. The American Midland Naturalist, Vol. 68, No. 2, pp. 424-429.

From April through October, 1945, sixty species of fishes were taken on a fisheries and limnological survey of the Missouri River at 11 widely scattered stations located between the Iowa-Missouri State line and the confluence with the Mississippi River. The survey was conducted by the Conservation Commission with the cooperation of the University of Missouri. Methods of collection are discussed. Collecting stations are shown on a map. Dates of collections, species of fishes collected, and number of fishes of each species in the collections at each station are indicated in two tables. (Auth.)

5483. Darnell, Rezneat M. (Marquette Univ., Milwaukee, Wisconsin). 1962. ECOLOGICAL HISTORY OF LAKE PONTCHARTRAIN, AN ESTUARINE COMMUNITY. The American Midland Naturalist, Vol. 68, No. 2, pp. 434-444.

During the past 5,000 years since stabilization of the level of the Gulf of Mexico, the Lake Pontchartrain basin has undergone drastic environmental changes. About 2,000 years ago when the Mississippi River established its course in the New Orleans area one of the early deltaic distributaries impounded an arm of the Gulf, creating the Lake Pontchartrain basin. Since this time the basin has undergone rapid filling from a variety of sources, as well as gradual freshening. Associated with these changes, as revealed by the fossil record, the sedentary benthic invertebrates have included a progression of species reflecting the respective environments from the marine tidal flat community of 5,000 years ago (Dosinia and Mercenaria), through the brackish-water assemblage of 2,000 years ago (Crassostrea and Thais), to the present-day near-fresh community (Rangia, Mytilopsis, etc.). Along with filling and freshening the lake has apparently come under greater influence of weather conditions which now induce sudden and severe changes in the hydrographic environment. This physical instability is also reflected in the nature of the fauna. Although over 300 species are currently recognized from the lake, only about 4 maintain large endemic populations as year-around residents, a clam (Rangia cuneata),

crab (Rithropanopeus harrisii), copepod (Acartia tonsa), and fish (Anchoa mitchilli). Most of the remaining abundant species are migratory and spawn elsewhere, invading the lake as seasonal transients. Their population levels and the species composition of the fauna, in general, vary dramatically from one season to another and from year to year, apparently reflecting to a large degree the influence of the physical factors on larval migration and establishment. Impoundment has apparently been followed by a great increase in the availability of humus from decaying marsh grass, a retardation of flushing, an increase in siltation, and a general rise in turbidity. As a result the community appears to have progressed toward a heterotrophic condition in which the consumer species are greatly dependent upon organic detritus originating, in large measure, outside the lake. Detritus feeders are now among the most successful species comprising the community of this lake. (Auth.)

5484. Judd, W. W. (Dept. of Zool., Univ. of Western Ontario, London, Canada). 1962. A STUDY OF THE POPULATION OF INSECTS EMERGING AS ADULTS FROM MEDWAY CREEK AT ARVA, ONTARIO. The American Midland Naturalist, Vol. 68, No. 2, pp. 463-473.

Between April 14 and October 15, 1959, 8,399 adult insects were trapped in five tent-traps set out on Medway Creek. The orders represented were Ephemeroptera (0.04%), Trichoptera (0,3%), Hemiptera (0.04%), Coleoptera (0.05%), Diptera (99.56%), Hymenoptera (0.01%). Midges of the family Chironomidae constituted 99.62% of the Diptera. Other families of Diptera, present in much smaller numbers, were Ceratopogonidae, Mycetophilidae, Empididae, Ephydridae, Borboridae, Lauxaniidae, and Muscidae. The numbers and seasonal occurrences, including times of maximum emergence, are reported for each species. (Auth.)

5485. George, J. C. (Dept. of Zool., The Maharaja Sayajirao Univ., Baroda, India). 1962. A HISTOPHYSIOLOGICAL STUDY OF THE RED AND WHITE MUSCLES OF THE MACKEREL. The American Midland Naturalist, Vol. 68, No. 2, pp. 487-494.

The red and white muscles of the mackerel, Rastrelliger kanagurta Russell, were studied with respect to their fat content and enzyme (lipase and succinic dehydrogenase) concentrations. It was found that the red muscle, concentrated along the lateral line had a considerably higher amount of extra- as well as intra-cellular store of fat and lipase activity in the fibers. Histochemical observations showed that succinic dehydrogenase was localized in the mitochondria which were numerous in the red and sparse in the white muscle fibers. The red muscle was thus found to be well adapted for an aerobic metabolism to use fat as the chief fuel for muscular activity and the white for an anaerobic metabolism to use mainly glycogen. The respective roles of the two muscle types in the migratory travel of this fish as well as of others are suggested. (Auth.)

5486. Kelly, H. D. (Alabama Dept. of Cons., Montgomery). 1961. AN EVALUATION OF PRE-STOCKING CHECKS CONDUCTED BY FISHERY BIOLOGISTS IN ALABAMA PONDS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 186-193.

In its attempt to provide more and better fishing in the State, the Fisheries Section of the Alabama Department of Conservation initiated a program whereby fishery biologists would check all ponds before they were stocked with hatchery fish. Attempts were made to contact each pond owner, check the pond in his presence, and advise him of the proper methods of stocking and management which have resulted from fisheries research in Alabama.

A total of 845 ponds were checked in 14 counties in east-central Alabama during the period of September 1955 through September 1959. Of the 845 ponds checked, 766 were approved and stocked while 79 were disapproved for various reasons.

Balance checks were conducted in 114 of the approved ponds during the first year of fishing. These checks revealed that 81 ponds were in balance, 10 were crowded with bass, 20 were overpopulated with bluegills, and 3 were unbalanced because of large populations of undesirable fish. Collectively, 80 percent of the 114 ponds checked were successful and indicates that a high percentage of successful ponds can be realized from prestocking check programs as opposed to stocking ponds without such programs. (Auth.)

5487. Houser, Alfred, and Bob Grinstead (Oklahoma Fish. Res. Lab., Dept. of Wildlife Cons., Oklahoma City). 1961. THE EFFECT OF BLACK BULLHEAD CATFISH AND BLUEGILL REMOVALS ON THE FISH POPULATION OF A SMALL LAKE. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 193-200.

The effect of removing various amounts of bluegill and black bullhead catfish from a small lake on the remaining fishes was studied. Estimates of population size by mark and recapture, numbers of desirable size fish, condition indexes and age and growth rates reveal some improvement in certain species but it was concluded that removals alone may not always produce greatly improved fish populations. (Authors)

5488. Huish, Melvin T. (Florida Game and Fresh Water Fish Comm., Leesburg, Florida). 1961. TOXAPHENE AS A FISH ERADICANT IN FLORIDA. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 200-205.

Experiments to determine concentrations of toxaphene lethal to fishes in a variety of lake types and to discern selective fish-killing properties of the material were conducted. Concentrations

ranging from 1 to 85 parts per billion were placed in fourteen bodies of water varying in size from 0.5 to 2,100 acres. Vegetative cover varied from 0 to 95 percent, methyl orange alkalinity from 2 p.p.m. to 74 p.p.m., and hydrogen-ion concentrations from 5.1 to 9.5. Bottom types included gravel, sand, silt, and mud.

Differences in concentrations required to cause total kills of fish populations in treated lakes appeared to be related to bicarbonate alkalinities, bottom types, amounts of plankton, vegetation, and the sizes of fish present. (Auth.)

5489. Johnston, Kenneth H. (North Carolina Wildl. Resources Comm., Raleigh). 1961. REMOVAL OF LONGNOSE GAR FROM RIVERS AND STREAMS WITH THE USE OF DYNAMITE. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 205-207.

During the summer and fall of 1957, experiments with dynamite were conducted to determine an effective method of removing concentrations of longnose gar, Lepisosteus osseus, from the large coastal streams of North Carolina. A "suspended series" of charges was the most effective method tested. Charge of 3 sticks of dynamite, suspended at depth of 8 to 10 feet produced the best lethal range. Selective blasting with this method provided efficient removal of longnose gar. During one day's operation, over 3 1/2 tons of gar were removed while killing 8.3 pounds of game fish. (Auth.)

5490. McBay, Luther G. (Alabama Dept. of Cons., Div. of Game and Fish, Montgomery). 1961. THE BIOLOGY OF TILAPIA NILOTICA LINNEAUS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 208-218.

Studies concerning the reproductive behavior, spawning temperatures, fecundity, period of egg formation, food habits, and lower lethal temperatures of the exotic cichlid, Tilapia nilotica, were conducted in aquaria and in earthen ponds at Auburn University, during the period of April 1959 to June 1960. These studies suggest that the spawning behavior of T. nilotica is typical of that of many cichlids and consists of schooling by the females, territorial establishment by the males, an intricate prespawning courtship, spawning, and parental care by the female. During this period of parental care, the eggs are carried in the buccal cavity until they hatch, and the fry remain there for about five days thereafter.

T. nilotica spawned in aquaria at a constant temperature of 74° F. Spawning occurred in ponds in late April when diurnal temperatures ranged from 70° to 84° F.

The fecundity was found to vary considerably with the size of the brood fish and on a seasonal basis. Relatively lighter broods were produced at the initial spawning. Mean seasonal values for 5-, 6-, and 7-inch fish were calculated at 160, 261, and 462 eggs per spawn, respectively. In aquaria kept in the Fisheries Building, Auburn University, spawning occurred at 5 to 8 week intervals. Egg formation began at a relatively early age. Fish from ponds receiving supplemental feeding were found to form eggs when they were 4 inches in length and about 50 days old.

T. nilotica was omnivorous with greater concentrations of zoo-organisms, primarily Entomostraca and Chironomids, being utilized by smaller sizes of fish. T. nilotica of the 6- and 9-inch groups, in a Pithophora infested pond, utilized the alga quite extensively, whereas it comprised only a negligible part of the diet of smaller sizes of fish.

Temperature induced mortality occurred in ponds at 48° F and was limited to fish less than 6 inches in length. Mortality in the larger inch-groups occurred progressively with decreasing water temperature. Some 9-, 10-, and 11-inch fish tolerated 37° F for a short period of time; however, continued exposure to temperatures below 55° F cumulatively affected these larger fish and resulted in mortality. The last survivors of these larger inch groups were observed on January 13, after 32 days of water temperatures below 55° F. (Auth.)

5491. Brown, Bradford E., and J. S. Dendy (Auburn Univ. Agri. Experiment Sta., Auburn, Alabama). 1961. OBSERVATIONS ON THE FOOD HABITS OF THE FLATHEAD AND BLUE CATFISH IN ALABAMA. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 219-222.

In the Tombigbee, Alabama, and Tensaw Rivers, 34 flathead catfish (Pylodictis olivaris) and 152 blue catfish (Ictalurus furcatus) were collected by use of telephone-magneto shockers for stomach analysis. Transition in feeding habits from invertebrates to major use of fish occurred in flathead catfish at approximately 10 inches total length, and in blue catfish through the inch groups 8-13. Feeding habits in the three rivers are compared. Data on lengths of catfish and foods eaten are presented. (Authors)

5492. Barkuloo, James M. (Florida Game and Fresh Water Fish Comm., Panama City, Florida). 1961. DISTRIBUTION AND ABUNDANCE OF STRIPED BASS (ROCCUS SAXATILIS, WALBAUM) ON THE FLORIDA GULF COAST. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 223-226.

Striped bass, Roccus saxatilis, (Walbaum), occurs in all major river systems along the Florida Gulf Coast from the Suwannee River west to the Perdido.

The only striped bass population in West Florida known to spawn successfully was in the Apalachicola River Drainage. The population level for the other rivers was too low to maintain a sport fishery.

The Apalachicola River stock of striped bass is discussed in detail. (Auth.)

5493. Whitworth, Walter R., and William H. Irwin

(Oklahoma State Univ., Stillwater, Oklahoma). 1961. THE MINIMUM OXYGEN REQUIREMENTS OF FIVE SPECIES OF FISH UNDER QUIESCENT CONDITIONS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 226-235.

The minimum oxygen requirements of the following five species of fish were studied under quiescent conditions. Lebistes reticulatus (Peters); Gambusia affinis (Baird and Girard); Pimephales promelas (Rafinesques); Hybognathus placitus (Girard); and Notropis girardi (Hubbs and Ortenburger). Nitrogen gas was bubbled through the waters in the test vessels to remove the dissolved oxygen. The fish were tested under varied temperatures and at different levels of oxygen depletion. All specimens tested were able to live at oxygen tensions of 1.0 ppm. The reactions of the fish varies with (1) the spread of oxygen removal, and (2) the species. (Authors)

5494. Lawrence, J. M. (Agri. Exper. Sta., Auburn Univ., Auburn, Alabama). 1961. ESTIMATED LENGTHS OF VARIOUS FORAGE FISHES SPOTTED BASS CAN SWALLOW. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 235-236.

The estimated total length of several species of forage fishes that spotted bass, Micropterus punctulatus, of given total lengths can swallow are given. (Auth.)

5495. Thomaston, Willard W., and Howard D. Zeller (Georgia Game and Fish Comm., Atlanta, Georgia). 1961. RESULTS OF A SIX YEAR INVESTIGATION OF CHEMICAL SOIL AND WATER ANALYSIS AND LIME TREATMENT IN GEORGIA FISH PONDS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 236-245.

In some Georgia farm ponds a satisfactory phytoplankton growth is not produced following the application of normal amounts of fertilizer. Chemical investigations indicated a slightly acid condition and a low total hardness in these problem ponds. This condition was corrected by the addition of one ton per acre of agricultural lime or with varying amounts of hydrated lime added periodically.

Phytoplankton production was definitely improved in over 100 Georgia farm ponds after the addition of lime. The average total hardness increase in these ponds, using agricultural lime at the rate of one ton per acre, was 15 ppm. Results lasted from 2-4 years. Hydrogen ion alone is not a satisfactory measure of the need for lime. Total hardness of the water was found to be the best and most reliable measure for lime supplements.

For optimum fertilization results, the total hardness range should be 20 ppm or above. From 10-20 ppm results were varied, and below 10 ppm fertilization results were unsatisfactory.

Ponds with a calcium oxide content in the bottom soils of 1500 lbs. per acre or above produced good fertilization results. With calcium oxide in the range of 1000-1500 lbs. per acre, results were varied, and below 1000 lbs. per acre of calcium oxide, fertilization results were invariably poor. (Authors)

5496. Stevenson, James H. (Bur. of Sport Fish. and Wildl., Stuttgart, Arkansas), and Andrew H. Hulsey. 1961. VERTICAL DISTRIBUTION OF DISSOLVED OXYGEN AND WATER TEMPERATURES IN LAKE HAMILTON WITH SPECIAL REFERENCE TO SUITABLE RAINBOW TROUT HABITAT. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 245-255.

Lake Hamilton is the middle of three lakes located in series on the Ouachita River in Southwestern Arkansas. Following the initial release of water through the penstocks from the upper newest lake, a subsurface current was detected in Lake Hamilton. During the summer of 1960, physical-chemical tests were made at nine stations along the channel to determine the extent of the current. Data collected showed the water remained oxygenated from the surface to the bottom. Cold water drawn from below the thermocline of the upper lake becomes oxygenated in the tailrace and slides under the warm upper stratum of water in Lake Hamilton. Existing temperature ranges and sufficient dissolved oxygen levels, as were found in the channel, should sustain trout throughout the critical summer months. (Authors)

5497. Ward, Claud M., and W. M. Irwin (Oklahoma State Univ., Stillwater, Oklahoma). 1961. THE RELATIVE RESISTANCE OF THIRTEEN SPECIES OF FISHES TO PETROLEUM REFINERY EFFLUENT. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 255-276.

Twelve species of fishes native to Oklahoma were each tested four times in a series of twenty bioassays, and the guppy was included in each bioassay as a reference. The 24-hour median tolerance limits (TLm's) were determined. The relative sensitivity of each species was established. In a 5% multiple range test, the species were grouped into the following six statistical populations: (1); (2); (3-5); (4-10); (5-12); and (6-13). In the following ranked list, numbers in parentheses (also the rank numbers of the species) indicate the statistical populations to which the species could belong with no significant difference, while species not included in numbers in parentheses are significantly different from the population included. Fishes rank from most resistant to least resistant as: 1. Lebistes reticulatus (1); 2. Ictalurus melas (2); 3. Notemigonus crysoleucas (3-5); 4. Notropis lutrensis (3-5), (4-10); 5. Lepomis microlophus (3-5), (4-10), (5-12); 6. Pimephales notatus (4-10), (5-12), (6-13); 7. Notropis boops (4-10), (5-12), (6-13); 8. Lepomis cyanellus (4-10), (5-12), (6-13); 9. Lepomis megalotis (4-10), (5-12), (6-13); 10. Ambloplites repestris (4-10), (5-12), (6-13); 11. Chrosomus erythrogaster (5-12), (6-13); 12. Ictalurus punctatus (5-

12), (6-13); 13. Micropterus salmoides (6-13).

The suitability of each species as a test animal is considered, based on information on the life histories and observations made during these tests. (Authors)

5498. Fish, Frederic F. (North Carolina Wildlife Resources Comm., Raleigh). 1961. SAMPLING IN THE ADCLAUSTRAL ZONE OF A POWER RESERVOIR. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 276-280.

Spot checking the stratification pattern existing within a power reservoir generally consists of a single series of oxygen and temperature determinations taken vertically at the point of maximum depth. The point of maximum depth ordinarily is found immediately upstream from the impounding structure.

Data secured from a series of observations in the John H. Kerr Reservoir, Virginia, are presented which confirm Ellis' warning of 1936 that reservoir stratification in the immediate proximity of a power dam is very unstable and samples collected therefrom may yield entirely different results from samples taken at the same depth but beyond the limits of the adclaustral zone.

When determining the stratification pattern within a power reservoir, a series of vertical profiles is indicated. These observations should be spaced along the inundated stream bed as closely as circumstances will permit. When only a single profile is possible for determining the stratification pattern, that profile should be secured at a considerable distance from the impounding structure. (Auth.)

5499. Oncale, Taylor A. (Soil Cons. Serv., Rome, Georgia), and Floyd R. Fessler. 1961. COOL-WATER OVERFLOW-DESIGN FOR PONDS AVOIDS DAMAGE TO TROUT WATERS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 281-286.

Coolwater inlets on impoundment structures will:

Maintain or increase the oxygen content of the downstream water.

Increase the temperature of the downstream water only a few degrees, not enough to damage trout waters significantly.

Improve the impounded water for fish by removing the low-oxygen water from the lower depths of the pool and providing a larger layer of water with suitable temperature and oxygen characteristics. (Authors)

5500. Bayless, Jack D. (North Carolina Wildlife Resources Comm., Raleigh). 1961. THE USE OF ELECTRICAL STIMULI IN LIVE-PICKING ORGANISMS FROM BOTTOM SAMPLES. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 286-288.

A simple, portable, and effective apparatus for electrically stimulating macrobenthos is described as a material aid for rapid picking of bottom samples in the field.

Experience has demonstrated that the use of electrical stimulation not only shortens the time required, but it also results in recovering many organisms that otherwise would be overlooked. (Auth.)

5501. Phillippy, C. L. (Hyacinth Control Div., Lakeland, Florida). 1961. PRELIMINARY RESULTS OF HERBICIDES TESTED ON CERTAIN AQUATIC PLANTS IN FLORIDA. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 288-295.

A screening program to determine the effects and best methods of applying new developments in herbicides on noxious aquatic weeds is a part of the efforts of the Florida Game and Fresh Water Fish Commission to improve its aquatic weed control program.

The program included tests that attempted to duplicate the problems encountered by field crews applying chemicals for weed control.

The herbicides tested were Endothal (disodium 3, 6-endoxohexahydrophthalate), Forron (2, 3, 5-trichlorophenoxyacetic acid propylene glycol butyl ether esters), Crop Rider (2-ethyl hexyl ester of 2, 4-dichlorophenoxyacetic acid), Weed Rap 20 (2-ethyl hexyl ester of 2, 4-dichlorophenoxyacetic acid), Urox (3(p-chlorophenyl)-1, 1-dimethylurea trichloracetate), 50-51 (sodium arsenite), 50-52 (sodium arsenite), 2, 4-DA Pellets (isopropylamine salt of 2, 4-dichlorophenoxyacetic acid), 2, 4, 5-T Pellets (iso-octyl ester of 2, 4, 5-trichlorophenoxyacetic acid), and M-1500 (2(2, 4, 5-trichlorophenoxy) propionic acid).

Preliminary results of the tests conducted during the screening program of 1960 indicated that Urox gave good control of Pistia stratiotes when applied at the rate of 22.5 and 11.25 pounds active ingredient per acre. M-1500, a silvex material, gave good control of Najas guadalupensis when applied at the rate of 2.5 and 1.55 p. p. m. Some control of Najas guadalupensis and Potamogeton illinoensis was obtained by Endothal. None of the herbicides tested on Myriophyllum sp. and Polygonum sp. gave any indication of control. (Auth.)

5502. Burress, Ralph M. (Missouri Conservation Comm., Jefferson City). 1961. FISHING PRESSURE AND SUCCESS IN AREAS OF FLOODED STANDING TIMBER IN BULL SHOALS RESERVOIR, MISSOURI. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 296-298.

In April 1958 creel censuses on the White River Arm of Bull Shoals Reservoir, Missouri, were altered to permit separate tabulations of data from anglers who fished exclusively in three areas of flooded standing timber. The combined acreage of the timbered areas is 6.3 acres, or 0.26 percent of the entire creel census area (2,380 acres). During 1959 nearly 15 percent of all anglers counted were

timber fishermen. Fishing pressure in that year amounted to 5,138 hours per acre in timbered areas, as compared to 97 hours per acre in the remainder of the census area. The hook-and-line harvest in timbered areas was 3,054 pounds per acre, and in the remainder of the area was about 113 pounds per acre. In 29 months, 821 timber fishermen were interviewed, of whom 94.8 percent were successful. Their rate of catch amounted to 1.25 fish per hour. At the same time, 1,580 anglers who "still" fished in open water (the most nearly comparable group of anglers) were interviewed, of whom 90.6 percent were successful. Their rate of catch was 1.36 fish per hour. Timber anglers caught fewer kinds of fish than other anglers. In comparison with anglers "still" fishing from boats in open water, they caught the same percentage of crappie, more bluegill and largemouth bass, but fewer channel catfish and white bass. (Auth.)

5503. Sneed, Kermit E., Harry K. Dupree, and O. L. Green (Southeastern Fish Cultural Lab., Marion, Alabama). 1961. OBSERVATIONS ON THE CULTURE OF FLATHEAD CATFISH (PYLODICTIS OLIVARIS) FRY AND FINGERLINGS IN TROUGHS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 298-302.

Flathead catfish fry were reared to fingerling size in troughs by starting them to feed on shrimp and marine fish. Other foods that were subsequently eaten by fry and fingerlings included beef liver, spleen, egg yolk, cheese, canned dog food, canned salmon, and some dry cereal feed. The food was prepared by placing the meats in a blende, adding a small amount of water, and stirring until the food was "creamy" in texture. After approximately three weeks, the fish had increased in size so that they could consume the food passed through a food chopper.

No feeding was attempted until the yolk sac had been absorbed and the fish exhibited feeding behavior. After two or three days, if not fed, the fry will not feed even though food is offered.

The food was placed (with a pipette or by rubbing between fingers) in the water above the fish. Since the fish lost interest in the food as soon as it reached the bottom of the trough, that amount of food that could be consumed before it fell to the bottom and lost was considered the optimum portion. Initially, these fish were fed frequently during the daylight hours; but after about three weeks, the number of feedings was decreased to four daily.

Initial mortalities from non-feeding individuals were estimated to be less than 10 percent, while the total observed mortality up to 110 days after hatching was estimated to be less than 20 percent, although accurate records were not kept. Unobserved losses may have exceeded 50 percent. Some of these losses were contributed to cannibalism, but the majority were contributed to predators (rats, mink). Since the purpose of the experiment was only to determine if flathead catfish could be raised in troughs on artificial food, the records on age and growth, food conversion, and other experimental data were not kept.

At the conclusion of the experiment, approximately 110 days after the eggs hatched, the fish had reached three to four inches in length and were apparently in "good" condition. However, the rate of growth, degree of cannibalism, and maximum size that can be attained in troughs may be influenced by rate of stocking, frequency of grading, etc. Therefore, if these species prove to be of value in fisheries management, much additional research should be conducted on its culture. (Authors)

5504. Prather, E. E. (Auburn Univ. Agri. Exper. Sta., Auburn, Alabama). 1961. A COMPARISON OF PRODUCTION OF ALBINO AND NORMAL CHANNEL CATFISH. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 302-303.

Albino (golden) and normal channel catfish were compared in feeding experiments during a 346-day period. There was no difference in rate of growth, but the percentage of survival was 94.2 for the normal catfish and 81.1 for the albinos. Fishing success was similar for the two. (Auth.)

5505. Snow, J. R. (Bur. of Sport Fish. and Wildl., Marion, Alabama). 1961. FORAGE FISH PREFERENCE AND GROWTH RATE OF LARGEMOUTH BLACK BASS FINGERLINGS UNDER EXPERIMENTAL CONDITIONS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 303-313.

Experiments to determine the forage species preference of largemouth black bass fingerlings and a few larger bass are described. Data on the amount of food consumed, rate of growth and food conversion are presented. Forage minnows included were goldfish, Carassius auratus (Linnaeus), fathead, Pimephales promelas (Rafinesque) and bluegill, Lepomis macrochirus (Rafinesque). While there was evidence of considerable individual variation in the species of forage minnow preferred, the bass in the experiments preferred fatheads more frequently than the other species, goldfish were second choice and bluegills were last. The degree of preference between bluegills and goldfish did not appear to be great for the limited number of bass included. Food conversion was best on a fathead or bluegill diet.

Where four larger bass, 0.4-0.5 pound in size, were fed equal amounts of bluegills and fathead minnows, one fish showed no preference between the species, two preferred fatheads to a moderate degree while one showed a strong preference for fatheads. (Auth.)

5506. Sanderson, Albert E., Jr. (Maryland Water Pollution Control Comm., Annapolis). 1961. EVALUATION OF EFFECT OF TROTLINE USE ON THE POTOMAC RIVER FISHERY. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 314-319.

A prediction of the trotliner's average catch of

channel catfish using a 25 hook trotline fished at hour intervals was calculated from the experimental catch statistics and is shown in Table VI. The catch would vary depending upon the bait used and would rank in the same order as Table V for day and night sets.

Day catches would vary from a high of 8 using live goldfish to a low of none using beef melts for an average four-hour set.

Night catches would vary from a high of about 6 using live goldfish to a low of one for the poorest bait, beef melts.

Creel census of rod anglers made in the same area of the river as a part of the Federal Aid program revealed an average catch rate of 1.68 fish per hour (including "throwbacks") in the summer of 1957 (June 1 to September 1). The creel rate was 1.19 fish per hour. For a four-hour trip approximately 4.8 fish were creeled. Four hours is the approximate length of a daily trip. These catches were made by anglers using live baits, cut baits and artificial lures of their selection who were fishing in daylight.

The average of baits tested on trotlines would produce a catch of approximately 3.0 fish per four-hour daylight set and 2.8 fish for a night set.

Although the composition of trotline catches was one percent smallmouth bass, rod anglers' catches were 27 percent smallmouth and about 31 percent catfish. (Auth.)

5507. Lambou, Victor W. (Louisiana Wild Life and Fish. Comm., Baton Rouge). 1961. EFFICIENCY AND SELECTIVITY OF FLAG GILL NETS FISHED IN LAKE BISTINEAU, LOUISIANA. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 319-359.

In order to determine the efficiency and selectivity of flag gill nets in catching game fish, experimental flag gill nets were fished in Lake Bistineau during the period March through August 1956. Flag gill nets contain no lead line and are hung on a top line which contains no floats. The experimental nets used consisted of the following mesh sizes: 1.0, 1.5, 2.0, 2.5, 3.0, 3.5 and 4.5 inch square mesh. For summary purposes the various species of fish were grouped into 3 types: (1) commercial fish (2) game fish and (3) other fish. The more valuable commercial fishes were caught at higher rates in the larger mesh sizes. Game fish were caught at higher rates in the smaller mesh sizes. Data are presented on the frequency distributions of the catches per net day which should give a somewhat better idea of the potential of the various mesh sizes of flag gill nets when fished under commercial conditions than the mean catches. The size of fish available to be caught had in many instances a definite effect on the mean length of the fish caught by the various mesh sizes of flag gill nets. The catch of fish by the flag gill nets for the period March through May was compared with the catch for the period June through August and the catch for shallow sets was compared with the catch for deep sets. In order to determine the selectivity of flag gill nets, the relative composition of the flag gill net catches was compared to estimates of the relative composition of the fish population made by rotenone poisoning. Commercial fish and other fish were much more relatively abundant in the flag gill net samples while game fish were considerably more relatively abundant in the samples taken by rotenone poisoning. (Auth.)

5508. White, C. E., Jr. (Alabama Dept. of Cons., Montgomery). 1961. THE SELECTIVITY AND EFFECTIVENESS OF BAIT AND SNAG LINES FISHED IN THE TVA LAKES OF ALABAMA. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 359-367.

A study of bait and snag lines was conducted in the TVA lakes of Alabama from December 1958 through December 1959 to determine species composition of the catch, the effectiveness of bait and snag lines for taking fish and the effectiveness of various types of bait used on baited lines. Data were obtained by accompanying the fisherman as he removed the fish from his lines. Bait line catches were, by weight, 92 percent catfish and 4 percent buffalo and carp. Grasshoppers were the most effective bait used while threadfin shad were used on 47 percent of the baited hooks. Snag line catches were, by weight, 77 percent catfish and 21 percent buffalo and carp. Both bait and snag lines were selected for the taking of catfish; but they were considered ineffective for the taking of carp, buffalo and other non-game forage fish. (Auth.)

5509. Howell, Henry H., and Harland R. Lutz (Kentucky Dept. of Fish and Wildl. Resources, Frankfort). 1961. HOW MANY OUT-OF-STATE FISHERMEN PURCHASE MORE THAN ONE LICENSE IN KENTUCKY, AND WHERE AND WHEN DO THEY FISH? Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 367-379.

Since the distribution of Federal Dingell-Johnson funds to the several states is determined in part by the number of out-of-state licensees fishing in a state, the Federal Government requested that Kentucky check its license sales to determine the number of duplicate purchases in order that the funds might be administered properly. To comply with this request, the Kentucky Department of Fish and Wildlife Resources asked the Division of Science and Mathematics, Asbury College, to determine for the state the number of duplications which occur annually in the purchase of ten-day non-resident fishing licenses. (Authors)

5510. Johnson, Raymond E. (Bur. of Sport Fish. and Wildl., Washington, D. C.). 1961. TWO NEW FISHERY RESEARCH PROGRAMS IN THE SOUTHEASTERN UNITED STATES. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 379-380.

Appropriations for the Bureau of Sport Fisheries

and Wildlife, beginning July 1, 1961, include two items of interest to southeastern fishery managers and administrators. One is the sum of $85,000 for research on reservoir fish productivity in the White River Interstate Reservoir Complex in northern Arkansas and southern Missouri. The other is the sum of $105,000 for studies of methods of eliminating undesirable fish from streams and lakes in the southeastern United States. (Auth.)

5511. Lambou, Victor W. (Louisiana Wild Life and Fish. Comm., Baton Rouge). 1961. DETERMINATION OF FISHING PRESSURE FROM FISHERMEN OR PARTY COUNTS WITH A DISCUSSION OF SAMPLING PROBLEMS. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 380-401.

One of the basic and often most difficult aspects of creel surveys on large reservoirs and other large bodies of water is the problem of determining fishing pressure. Often the only feasible method of determining fishing pressure is by making counts of fishermen or fishing parties while the fishermen are in the process of fishing. This report reviews this method of determining fishing pressure and discusses the sampling problems involved. (Auth.)

5512. White, C. E., Jr. (Alabama Dept. of Cons., Montgomery), and Ben Jaco. 1961. COMMERCIAL AND SPORT FISHING ON GUNTERSVILLE LAKE DURING THE PERIOD OF MARCH 15-JUNE 13, 1960. Proceedings of the Fifteenth Annual Conference, Southeastern Association of Game and Fish Commissioners, pp. 411-419.

A census of sport and commercial fishermen was conducted on Guntersville Lake from March 15 through June 13, 1960. The objectives were to determine species composition of the catches, the types and extent of sport and commercial fishing, the interrelationship of sport and commercial fishing and the problems of each. The census included data on incomplete fishing trips of sport fishermen and complete fishing trips of commercial fishermen.

Crappie were the fishing choice of 58 percent of the 1,654 sport fishermen and made up 69 percent of the catch by weight. An average of 0.4 pounds of fish per hour were caught by 1,315 boat fishermen while 339 bank fishermen caught an average of 0.2 pounds of fish per hour. Natural bait was used by 75 percent of the fishing parties, artificial bait was used by 10 percent of the fishing parties and both types of bait were used by 15 percent of the fishing parties. Only an average of 42 sport fishermen per day fished Guntersville Lake.

Fifty-nine commercial fishermen caught 3,138 pounds of fish in nets and on lines. Buffalo and carp made up 79 percent of the pounds of fish taken with nets. Catfish made up 85 percent of the pounds of fish taken on lines. Less than one percent of the catch, by weight, taken with each type of commercial fishing gear was game fish.

There appeared to be no conflict between the sport and commercial fishermen in Guntersville Lake. The catch of game fish in nets during the period when crappie were readily caught by sport fishermen indicated that legal mesh nets were not capable of taking a significant number of game fish. (Authors)

5513. Vladykov, Vadim D. (Univ. of Ottawa, Ottawa, Ontario, Canada). 1962. OSTEOLOGICAL STUDIES ON PACIFIC SALMON OF THE GENUS ONCORHYNCHUS. Fisheries Research Board of Canada, Bulletin No. 136, 172 pp.

Altogether 1,020 caudal skeletons of seven species of Oncorhynchus have been studied: gorbuscha, keta, kisutch, masou, rhodurus, nerka and tshawytscha.

Among elements of the caudal skeleton the shape and number of epural bones were most interesting. The number of epurals in different species can vary from 1 to 4.

Oncorhynchus gorbuscha, O. masou and O. rhodurus possess only 2 epurals.

Oncorhynchus kisutch and O. tshawytscha have typically 3 epurals, but sometimes 2 or even 1.

In O. keta the number of epurals can vary from 2 to 4; 3 is most frequent (91%). The occurrence of 2 epurals varies with the region: eastern Pacific (2.7%), British Columbia (8.2%), and western Pacific (12%).

Among 632 O. nerka from five regions the number of epurals varied as follows: 75.5% had 2 epurals, 21.5% had 3 epurals and 3% had 1 epural. The occurrence of 3 epurals in tails of O. nerka varies from 0% to 75% and has a definite relation to the place of the origin of fish. The highest occurrences of 3 epurals were found in 12 samples of O. nerka collected from four different areas. In the western Pacific, 3 samples had incidences of 3 epurals between 50 and 75%; from the eastern Pacific 4 samples had from 40 to 60%; in one sample each from Adak and Attu Islands, the incidence was 55 and 60%; and 3 British Columbia samples (Tally Creek, Port John and Alberni Canal) had incidences from 38 to 65%.

In British Columbia, the most contrasting samples of O. nerka were from Tally Creek (65% incidence of 3 epurals) and from Cultus Lake where no fish had 3 epurals.

Skulls of more than 2000 semi-adult and adult Pacific salmon were studied of all species except rhodurus.

Descriptions and illustrations have been given for five skull bones: supraethmoid, supralingual, vomer, premaxillary and maxillary.

The pigmentation pattern of the mouth cavity of the above 6 species are described and illustrated.

Stages of maturity for O. gorbuscha and O. nerka, based on gonad development and skull proportions, are defined and illustrated.

The numbers of pyloric caeca among samples of O. gorbuscha and O. keta from British Columbia were much greater than in samples from the Island of Hokkaido.

In the structure of four skull bones: supraethmoid, supralingual, vomer and premaxillary, the relationship between the 5 species of Oncorhynchus

is as follows:

gorbuscha and nerka are close together;

kisutch and masou have many points in common;

keta and tshawytscha are very different from the other species and from each other.

In the structure of the maxillaries, particularly their lower tooth-bearing edge, Oncorhynchus species fall into 3 groups:

straight-edged maxillary: gorbuscha, keta and nerka;

slightly bent maxillary: kisutch;

strongly bent maxillary: masou and tshawytscha.

Mature O. nerka from North America have teeth darkly pigmented inside. This is particularly pronounced in the case of teeth found on both jaws and supralingual. In no other species of Oncorhynchus was this observed.

Although there is a variation in the appearance of individual bones, in the present state of our knowledge it appears that no single bone is sufficient to separate stocks within species.

The relation between the length of the upper jaw (Uj) and the postorbital length (Op), which varies with sexual development of Pacific salmon, may eventually assist in the separation of different stocks. (Auth.)

5514. Poole, John C. (New York State Cons. Dept., Albany). 1962. THE FLUKE POPULATION OF GREAT SOUTH BAY IN RELATION TO THE SPORT FISHERY. New York Fish and Game Journal, Vol. 9, No. 2, pp. 94-117.

To investigate the causes for a decline in recent years in late-season fishing success for fluke in Great South Bay, 5,845 fluke were tagged from 1956 to 1959. Tagging was done in Great South Bay and in ocean waters off Shinnecock Inlet and Fire Island Inlet. Returns showed little movement of fluke out of the bay during summer, but they indicated heavy early-season fishing to be an important factor in the decline. In 1956 and 1959, when 25 to 30 percent of the calculated population was taken by sport fishing during June and July, the catch declined sharply during August and September. In 1958, on the other hand, the early catch was only 14 percent and that in August and September increased markedly.

Rates of exploitation of the fluke population by the sport fishery in Great South Bay each summer averaged about 20 percent. Since the bay is the primary summer nursery ground for young fluke, such rates are considered to permit a low degree of escapement of young fish. At present, the sport fishery is to a large extent dependent upon the abundance of fluke 30.5 centimeters or less in length. Returns in years subsequent to the one in which fluke were tagged in Great South Bay indicated a strong tendency for the population to return to the bay itself after wintering elsewhere. For recoveries during the second and third summers, from 25 to 53 percent were taken in Great South Bay and from 50 to 80 percent in all the south-shore bays of Long Island. Estimates of survival from year to year indicate that the sport fishery, the winter trawl fishery and the summer commercial fishery are overexploiting the fluke population at the present time.

Management to stabilize the catch in Great South Bay throughout the summer seems feasible by limiting in some manner the early fishing pressure. There also appears to be a need for size or catch limits to permit greater escapement of small fluke. (Auth.)

5515. Kelly, William H. (New York State Cons. Dept., Albany). 1962. CONTROLLING ARGULUS ON AQUARIUM CARP. New York Fish and Game Journal, Vol. 9, No. 2, pp. 118-126.

Tests of five essential oils for selective toxicity toward the copepod ectoparasite Argulus americanus indicated that only balsam Peru oil was effective; the others were nonselective, being about as toxic to the host as they were to the parasite at equivalent time-concentrations. Comparative studies of the chemical constituents of these oils disclosed that two esters of cinnamic acid, benzyl cinnamate and cinnamyl cinnamate, were confined exclusively to balsam Peru oil. In further tests no selectivity was ever produced in the absence of chemicals incorporating esters of cinnamic acid, and selectivity never failed to appear in the presence of compounds incorporating these esters.

Practical control of Argulus was achieved in 500-gallon laboratory aquaria using 1:25,000 preparations of either balsam Peru oil or benzyl cinnamate. Disinfection in 3 hours, and complete mortality of the parasites in 48 and 70 hours, respectively, resulted. Several limitations are discussed. A reliable criterion of parasite mortality was found. (Auth.)

5516. Loeb, Howard A. (New York State Cons. Dept., Albany). 1962. EFFECT OF LYSERGIC ACID DIETHYLAMIDE (LSD-25) ON THE SURFACING BEHAVIOR OF LABORATORY CARP. New York Fish and Game Journal, Vol. 9, No. 2, pp. 127-132.

Lysergic acid diethylamide (LSD-25) is a water soluble derivative of d-lysergic acid. For a number of years it has been used in psychiatric work because it causes schizophrenic-type symptoms in man and breaks down inhibitions. Contact doses of 1 ppm or less cause surfacing of Siamese fighting fish, carp and goldfish and probably various minnows. Largemouth bass and brook trout are not similarly affected. Toxic effects of a solution in a laboratory tank lasted for 19 days. Surfacing compounds may be of considerable use in fish management in both sport and commercial fisheries. (Auth.)

5517. Alsop, Rosalind G. (Dept. of Ent., Cornell Univ., Ithaca, New York). 1962. GROWTH AND FOOD OF WHITE PERCH IN ONEIDA LAKE. New York Fish and Game Journal, Vol. 9, No. 2, pp. 133-136.

Data for 484 white perch from Oneida Lake indicate that the growth rate was high during the first two years of life but that it decreased markedly after age III. Rapid growth of the 1954 year class

suggests that the population density was low. Stomach examinations showed that chironomids, mayflies and entomostraca, collectively, were the most important food group. (Authors)

5518. Kelly, William H. (New York State Cons. Dept., Albany). 1962. DYE-INDUCED EARLY HATCHING OF BROWN TROUT EGGS. New York Fish and Game Journal, Vol. 9, No. 2, pp. 137-141.

Immersion dying with three chemicals, Neutral Red, Nile Blue Sulphate and Bismarck Brown Y, produced early hatching of brown trout eggs. Neutral Red was the most nearly satisfactory. The importance of treating only eggs containing well-developed embryos was evident, proper timing of treatment being a critical factor in production of viable fry. (Auth.)

5519. Allen, K. Radway (Box 202, Wellington, New Zealand). 1962. THE NATURAL REGULATION OF POPULATION IN THE SALMONIDAE. Science Review, Vol. 20, No. 3, pp. 58-62.

Food supply and direct causes of mortality can both play an important part in population regulation although they produce different effects on the population size and structure. Different causes of mortality as, on one hand, extent and nature of spawning grounds, and, on the other, predation both within the species itself and by other species can also have important effects, each of them in several different ways. (Auth.)

5520. Richards, C. E. (Virginia Inst. of Marine Sci., Gloucester Point). 1962. A SURVEY OF SALT-WATER SPORT FISHING IN VIRGINIA. Chesapeake Science, Vol. 3, No. 4, pp. 223-235.

A survey of sport fishing in a 1500 square mile area within the Virginia portion of Chesapeake Bay and its tributaries was made from mid-April through October to gain general knowledge of the fishery and its relation to commercial landings. Effort estimates were based on daily boat-counts from a bridge overlooking the York River check area and aerial boat-counts from flights over the entire survey area. Voluntary catch records and interviews were the sources of catch-rate information. Logbook records were generally different from interview records and set catch-rates at a significantly higher level in the areas where both methods were used.

Reported sport catches of the four most important commercial food fishes amounted to a low of approximately 8.1 percent in 1955 to a high of 27.2 percent in 1959, of the total catch. The decline of croaker in the catch was severe, 2.2 fish per man-hour in 1955 to 0.2 fish per man-hour in 1960. A decrease in catch rates of croaker as the number of fishermen aboard party boats increased was noted. Spot catches increased and became the most abundant fish in the fisherman's creel during 1959 and 1960, 1.5 and 2.6 fish per man-hour of fishing. They were also the most abundant fish for 1958 but at a catch rate of 0.8 fish per man-hour. Weakfish or gray sea trout declined from 0.7 fish per man-hour in 1955 to 0.2 fish per man-hour of fishing during 1960. The observed increases in availability of striped bass, puffer, and flounder compared to the declining availability of other fishes is interesting although there may be no connection between these stocks. (Auth.)

5521. Pacheco, Anthony L. (Biol. Lab., Bur. of Comm. Fish., Beaufort, North Carolina). 1962. MOVEMENTS OF SPOT, LEIOSTOMUS XANTHURUS, IN THE LOWER CHESAPEAKE BAY. Chesapeake Science, Vol. 3, No. 4, pp. 256-257.

A tagging study of spot was conducted in two lower Chesapeake estuaries. Limited summer movement of spot was exhibited suggesting the feasibility of assessing fishery exploitation by individual river systems. Two returns from the winter trawl fishery operating in the Hatteras area were indicative of an overwintering area. (Auth.)

5522. Mansueti, Romeo J., and Alice J. Mansueti (Chesapeake Biol. Lab., Solomons, Maryland). 1962. LITTLE TUNA, EUTHYNNUS ALLETTERATUS, IN NORTHERN CHESAPEAKE BAY, MARYLAND, WITH AN ILLUSTRATION OF ITS SKELETON. Chesapeake Science, Vol. 3, No. 4, pp. 257-263.

Catches of hook-and-line and commercial pound-net fishermen, and sightings of schools, of little tuna in northern Chesapeake Bay, Maryland, are discussed. This species had never been recorded in the estuary before 1951 in Maryland or in Virginia before 1946. Its occurrence in the bay is irregular, having been recorded only during early summer and in late fall. A small pound-net and haul seine fishery for it has existed in the Virginia part of the Bay for about a decade.

The gross topographic osteology of a 15 1/2 pound female little tuna caught in Chesapeake Bay off Kent Island, Maryland, is illustrated for the species for the first time. The unique trelliswork of the ventral vertebral column, one of the most important characters of the family Katsuwonidae, is shown in detail. It is formed from the divided haemapophyses that encloses a long canal to carry the large ventral blood vessel. Several modifications of vertebral terminology as they apply to the trellis are advanced. The entire skeleton in the Maryland specimen and its details are typical of those recorded for the little tuna elsewhere. (Authors)

5523. Pugh, John R. (Bur. of Comm. Fish., Biol. Lab., Seattle, Washington). 1962. EFFECT OF CERTAIN ELECTRICAL PARAMETERS AND WATER RESISTIVITIES ON MORTALITY OF FINGERLING SILVER SALMON. U. S. Fish and Wildlife Service, Fishery Bulletin 208, 12 pp.

Immediate and delayed effects of certain electrical parameters and water resistivities upon the mortality of fingerling silver salmon (O. kisutch) were determined in a statistically controlled

experiment. Differences in mortality attributable to differences between the variations of pulse shape, frequency, and water resistivity were noted after 24 hours but not after 30 days. Differences in mortality that could be attributed to differences between the variations of voltage and wiring pattern were not significant at either time. (Auth.)

5524. Caldwell, David K. (Bur. of Comm. Fish., Washington, D. C.). 1962. DEVELOPMENT AND DISTRIBUTION OF THE SHORT BIGEYE PSEUDOPRIACANTHUS ALTUS (GILL), IN THE WESTERN NORTH ATLANTIC. U. S. Fish and Wildlife Service, Fishery Bulletin 203, 48 pp.

The short bigeye, Pseudopriacanthus altus (Gill), is a marine fish restricted to the western North Atlantic, ranging, primarily on hard bottom, from Southport, Maine, south to the Virgin Islands and in the Gulf of Mexico and Bermuda waters. Caribbean and Bahamian records are scarce, and the species may range more widely in these areas than present findings indicate. The late-summer spawned larvae are pelagic, occurring in the Gulf Stream. The prejuveniles are pelagic initially, but they migrate to live at or near the bottom in sandy or rocky habitats where the adults are found. The larvae and prejuveniles undergo a transformation in color and color pattern as they change habitat. While changes in chromatophore arrangement are well-known for larvae, apparently the change in pigmentation to the final chromatophoral arrangement occurring in large prejuvenile P. altus is little known and rarely reported in fishes.

Meristic and proportional characters and their development from larvae through adults are discussed. The development of other morphological features, as well as color pattern, also is discussed in detail. (Auth.)

5525. Rounsefell, George A. (Bur. of Comm. Fish., Galveston, Texas). 1962. RELATIONSHIPS AMONG NORTH AMERICAN SALMONIDAE. U. S. Fish and Wildlife Service, Fishery Bulletin 209, Vol. 62, 36 pp.

The strengths of the relationships among species and genera of North American Salmonidae are assessed from published data on hybridization, coloration, and other attributes. The genus Salmo shows the greatest intrageneric variation. Phylogenetically, Salmo gairdneri is as close to the species of Oncorhynchus as to Salmo salar; and Salmo trutta, at the other extreme, is about midway between S. salar and the species of Salvelinus. The genus Salvelinus is a closely knit group. Of its species, Salvelinus marstoni shows the closest affiliation with Salmo.

Published data are scanty for several species and the methods of taking and recording data vary so widely that comparison of data taken by different investigators is hazardous. (Auth.)

5526. Fields, Hugh M. (North Carolina State College, Raleigh). 1962. POMPANOS (TRACHINOTUS SPP.) OF SOUTH ATLANTIC COAST OF THE UNITED STATES. U. S. Fish and Wildlife Service, Fishery Bulletin 207, Vol. 62, 34 pp.

Three species of pompano, Trachinotus carolinus (Linnaeus), T. falcatus (Linnaeus), and T. glaucus (Bloch), are residents of the South Atlantic Coast of the United States. T. carolinus is the most common species and the young are plentiful along the Georgia beaches during the warmer months. Beach recruitment is comprised of periodic waves of small individuals, the major influx appearing in April and May. Young T. falcatus are fairly common along the Georgia beaches during the warm season, appearing first in late May or early June; but recruitment is erratic, with only one wave, in September or October. Recruitment occurs almost all year long in Southern Florida. Young T. glaucus are stragglers along the Georgia beaches, appearing infrequently in collections between August and November and at larger minimum sizes than T. carolinus and T. falcatus. Unidentified Trachinotus, 3.05 to 4.66 mm. standard length, were taken in offshore waters. The sizes and locations of capture of offshore specimens of T. carolinus and T. falcatus indicate spawning probably in or near the Gulf Stream. Great variation in color, body depth, and profile is found in T. falcatus. Young of the three species and the smaller unidentified specimens are figured; natural history observations are presented; and growth and development are discussed. Additional reasons are given for considering T. argenteus (Cuvier) to be synonymous with T. carolinus, and T. goodei Jorgan and Evermann synonymous with T. glaucus. (Auth.)

5527. Baptist, John P., and Thomas J. Price (Fish. Res. Lab., Bur. of Comm. Fish., Beaufort, North Carolina). 1961. ACCUMULATION AND RETENTION OF CESIUM^{137} BY MARINE FISHES. U. S. Fish and Wildlife Service, Fishery Bulletin 206, Vol. 62, 11 pp.

Accumulation and retention of Cs^{137} by marine fishes were followed in laboratory experiments. Comparisons were made between accumulation directly from the water and from ingested doses. Cs^{137} was accumulated readily through both pathways by all fish tested.

Cesium^{137} concentration per unit weight in postlarval flounder (Paralichthys dentatus) was shown to vary inversely with changes in the rate of weight increase. This was attributed to the disparity between rate of accumulation and rate of weight increase.

Accumulation of Cs^{137} was generally similar in tissues of croaker (Micropogon undulatus), bluefish (Pomatomus saltatrix), and little tuna (Euthynnus alleteratus). These tissues, listed in order of highest concentration, were heart, liver, spleen, kidney, gills, gonad, muscle, skin and scales, blood, and bone.

Whole-body retention of Cs^{137} by postlarval flounder was expressed as two rate functions with biological half-lives of 5.3 and 36.9 days. Retention by certain tissues of croaker was expressed as multiple rate functions as follows: Skin, three rate

functions with biological half-lives of 6.2, 26.2, and 290.0 days; muscle, two rate functions with biological half-lives of 34.8 and 94.7 days; liver, four rate functions with biological half-lives of 0.7, 4.2, 24.1, and approaching infinite days; and gonad, two rate functions with biological half-lives of 13.4 and 911.0 days. (Authors)

5528. Dragovich, Alexander, and Billie Z. May (Bur. of Comm. Fish., Washington, D. C.). 1962. HYDROLOGICAL CHARACTERISTICS OF TAMPA BAY TRIBUTARIES. U. S. Fish and Wildlife Service, Fishery Bulletin 205, Vol. 62, 14 pp.

This study concerns some of the hydrological properties of the Hillsborough, Alafia, Little Manatee, and Manatee Rivers, which flow into Tampa Bay, Florida. Temperature, salinity, total phosphate-phosphorus, inorganic phosphate-phosphorus, nitrate-nitrite nitrogen, and copper content were recorded during a 15-month period. The observed variations are discussed in terms of differences in precipitation, river discharge, and general geological features of the area. (Authors)

5529. U. S. Department of the Interior (Washington, D. C.). 1962. EFFECTS OF PESTICIDES ON FISH AND WILDLIFE IN 1960. U. S. Fish and Wildlife Service, Circular 143, 52 pp.

This report summarizes research findings for 1960, and also some earlier work of the Bureau of Commercial Fisheries. Reports published by Service personnel in 1960 are reviewed, and progress is reported for research studies underway. Certain publications appearing in 1960 that were prepared by other scientists are reviewed also. Separate accounts summarize the studies of the Branch of Fisheries Research and the Branch of Wildlife Research, both in the Bureau of Sport Fisheries and Wildlife, and the Branch of Shellfisheries of the Division of Biological Research in the Bureau of Commercial Fisheries. Recommendations are made for the use of pesticides that will cause minimum damage to wildlife; and additional research needs are outlined. (From Foreword)

5530. Krause, Heinrich R. (Hydrobiologische Station für den Schwarzwald, Falkau, Germany). 1962. INVESTIGATION OF THE DECOMPOSITION OF ORGANIC MATTER IN NATURAL WATERS. FAO Fisheries Biology Report No. 34, 14 pp.

All natural waters have specific individual physical, chemical and biological characteristics, which together make difficult a direct application of the results from ideal experiments. Before application to a particular natural water would be reasonable, extensive studies of the ecology and population dynamics of more abundant and typical organisms, with particular regard to the rates of "natural mortality", would be necessary. Then the "specific decomposition power" of the water in question should be checked with the same dead organisms or populations in a series of relatively short period experiments in the field.

I believe that it should be possible to establish a "quantitative decomposition index" for a defined type of natural water. This can be done if some general and universal classification of waters - the classical problem in limnology - will also gain universal acceptance. All attempts to make a world-wide classification of natural waters are more or less useful working hypotheses, and many more results both from field observations and ecological studies on the one hand and from experiments and tests in the laboratory on the other hand, must be obtained. (Auth.)

5531. Anonymous (Fisheries Division, Food and Agriculture Organization of the United Nations, Rome, Italy). 1962. LIST OF MARINE INSTITUTIONS IN THE TROPICS (30° N to 30° S). FAO Fisheries Biology Technical Paper No. 20, 8 pp.

A list of 75 institutions in 44 countries.

5532. Keenleyside, Miles H. A., and Fred T. Yamamoto (Biol. Sta., St. Andrews, New Brunswick, Canada). 1962. TERRITORIAL BEHAVIOR OF JUVENILE ATLANTIC SALMON (SALMO SALAR L.). Behaviour 19(1/2): 139-169; Biological Abstracts, Vol. 40, No. 4, Abst. No. 13398. 1962.

Observations were made in the field and the laboratory. Agonistic activities occurring during the defense of territories are charging, nipping, chasing, and frontal display, - results of high attack tendencies; and lateral display and fleeing, results of high escape tendencies. Certain color changes are associated with extremes of aggression and submission. Among aquarium-held fish, territories are not defended actively until after a period of adaptation to new surroundings, particularly if the fish have been kept in crowded holding tanks for some time. More frequent feeding probably causes better condition and greater activity of the fish which results in more frequent infringements of territories and therefore an increase in agonistic encounters. Gradual increase in numbers of fish leads first to an increase, then to a falling off in agonistic activity, as the nonterritory-holding fish, which are moderately active with numbers of fish present, form a closely-knit, stabilized group as the aquarium becomes crowded. Territories of young salmon appear to be primarily feeding territories. Behavior associated with their maintenance is important for optimum growth and survival and for maintaining position for long periods in fast flowing streams. The fate of hatchery-reared fish planted in rivers may be related to their ability to secure and maintain territories in competition with wild fish. (G. N. L.)

5533. Pestova, I. M. 1959. HEMATOGENESIS IN TELEOSTS OF VARIOUS ECOLOGIC GROUPS. (KROVETVORENIE U KOSTISTYKH RYB RAZLICHNYKH EKOLOGICHESKIKH GRUPP.) Sb. Nauch. Trudov Permskii Med. Inst. 29. 126-132; Referat. Zhur., Biol., 1961, No. 5D439; Biological Abstracts, Vol. 40, No. 4, Abst. No. 17072. 1962.

Studies were made of the development patterns of the Ladoga salmon, Ladoga whitefish, freshwater

perch, sea horse and common sprat. Other experiments involved variations in the temperature regime (salmon), as well as the removal of spleen and introduction of colloid substances (perch). Four stages in the development of the hematogenetic system were identified for the non-pelagophile forms (i.e. first four species named above): 1. prior to the appearance of the initial blood cells in the vessels; 2. from the time of their appearance to the inceptive formation of hematogenetic kidney tissue; 3. from the inception of hematogenesis in the kidneys (terminal embryonic and larval development stages) and 4. from the inception of hematogenesis in the spleen (terminal larval and fry stages; blood formation corresponds with the process in adult individuals). The conclusion is drawn that developmental characteristics of the hematogenetic system in fish of various ecologic groups are influenced by environmental conditions and, first of all, aeration factors. Significant differences were found for members of one family (salmon, whitefish), while analogies were observed even in species of different orders (salmon, sea horse). Both instances are governed by factors of aeration and gaseous interchange.

5534. Shul'man, G. I. 1960. THE DYNAMICS OF THE BODY FAT CONTENT OF FISHES. (DINAMIKA SODERZHANIYA ZHIRA V TELE RYB.) Uspekhi Sovrem. Biol. 49(2): 225-239; Referat. Zhur., Biol., 1961, No. 4D483; Biological Abstracts, Vol. 40, No. 4, Abst. No. 17075. 1962.

The dynamics depend to a great extent on the biology of the fish. The time at which the maximum amount of fat accumulates varies, and may take place before, during, or after spawning. There are also differences in the limits of fluctuation of fattiness which are related to the abundance of food in the water and to the biology of the fishes. Sex-related differences in fattiness are small and are different in different species. The fattiness of many fishes decreases during gametogenesis; the extent of the decrease depends on the fertility. In many fishes the fattiness increases before the spawning period and then decreases on spawning. The fattiness increases after spawning in many fishes, but in some (those which spawn in the fall) it decreases. The fattiness of fishes increases with age because of the decrease in the rate of energy metabolism. There is a bibliography with 134 references.

5535. Zaks, M. G., and M. M. Sokolova. 1961. THE MECHANISMS OF ADAPTATION OF THE RED SALMON (ONCORHYNCHUS NERKA WALB.) TO CHANGES IN THE SALINITY OF WATER. (O MEKHANISMACKH ADAPTATSII K IZMENENIYAM SOLENOSTI VODY U NERKA--ONCORHYNCHUS NERKA (WALB.).) Voprosy Ikhtiol. 1(2): 338-346; Referat. Zhur., Biol., 1962, No. 2I45; Biological Abstracts, Vol. 40, No. 2, Abst. No. 8574. 1962.

A study was made of the amount of urine excreted, the osmotic pressure of the urine and blood plasma, the protein content of the blood, and the function of the sodium-transporting Keis-Wilmer cells of the gills in the red salmon at various periods of its life cycle. Subjects of the study were migrating salmon: the young at the beginning of their migratory path (BM) into the ocean; salmon artificially kept back (KB) for 2 weeks in fresh water; salmon which had already migrated, now at the end of their migratory path from the ocean (RM); and marine salmon (MS) caught 5 km from the mouth of the river where the fresh water section of their anadromous path begins. There was little difference among the salmon with respect to the amount of urine excreted, but diuresis in BM and RM was only 1/10 of that in all fresh-water fishes studied. The urinary osmotic pressure in fresh water of BM and RM is more than half of that of the blood; but in fresh-water fishes it is sharply hypotonic and is only 1/4 of the osmotic pressure of the blood. In KB the osmotic pressure of the urine approaches that of fresh-water fishes. In BM the osmotic pressure of the plasma is about the same as in fresh-water fishes. The percentage of protein in the blood of RM and MS was relatively high. When the salinity of the water increases, diuresis increases in BM, although the osmotic pressure in the urine remained practically the same; the osmotic pressure of the plasma increased with the salinity, but as soon as the environment became hypertonic with respect to the blood, the blood remained hypotonic at all values of the osmotic pressure of the environment and the percentage of protein in the plasma gradually decreased. This reaction is characteristic for marine fishes, not for fresh-water fishes, even though the BM had not yet come into contact with salt water. In KB, on the other hand, the reaction allowing BM to adapt to salt water disappeared. RM showed extremely low resistance to salt water; unlike diuresis in the BM, that in the RM stopped, the protein level in the plasma did not decrease, and in salt water the blood became hypertonic with respect to the water. In the red salmon the basic role in the adaptation to changes in osmotic pressure is played by the gill apparatus for salt transport, not by the kidney. The changeover in this apparatus is in preparation for the future change in the osmotic pressure of the water.

5536. Van Bergeijk, Willem A., and Susan Alexander (Bell Telephone Lab., Murray Hill, New Jersey). 1962. LATERAL LINE CANAL ORGANS ON THE HEAD OF FUNDULUS HETEROCLITUS. Jour. Morphol. 110(3): 333-346; Biological Abstracts, Vol. 40, No. 3, Abst. No. 11292. 1962.

The microscopic anatomy of the lateral line canals and the sensory maculae is described. Six pairs of lateral line canals are found on the head of Fundulus heteroclitus. Each canal has from 2 to 7 pores, and 1 to 6 sensory maculae, 1 between each 2 pores. In most canals, the maculae lie closer to the caudal, resp. medial, pores of their canal segments than to the anterior, resp. lateral, pores. Each macula consists of an oval patch of supporting cells, with a strip of sensory cells running in the long axis, which is parallel to the axis of the canal.

Emerging from each macula, and connecting adjoining maculae in a canal, is an undifferentiated cord of mesenchymal cells, which is thought to be a remnant of the embryonic lateral line placode. The cupula which covers the macula probably reaches from the macula to the roof of the canal, but appears to leave some space between itself and the lateral walls of the canal. The wall of the canal consists of 2 concentric layers of flattened epithelium, in between which is a layer of mucous cells in various stages of development. Mucous cells are exceedingly numerous inside the canals, but are completely absent in the region surrounding the macula. Suggestions are offered about the functions of the various structural peculiarities found, but experimental evidence is too scanty to form a firm hypothesis. (Authors)

5537. Janaske, Paul C. (American Inst. of Biol. Sci., Washington 6, D. C.). 1962. INFORMATION HANDLING AND SCIENCE INFORMATION. A SELECTED BIBLIOGRAPHY 1957-1961. PART II. American Institute of Biological Sciences, BSCP, 256 pp.; Biological Abstracts, Vol. 40, No. 3, Abst. No. 8738. 1962.

The American University, School of Government and Public Administration, Center for Technology and Administration, and the American Institute of Biological Sciences conducted a seminar "Biological Sciences Communication" during the weeks of June 19-30, 1961. The objective of the seminar was to identify and review problems associated with the flow of biological science information from the scientist who produces it to the scientist who uses it. A report of the seminar is issued as "Information and Communication in Biological Science", and edited by L. H. Hattery. It was the intention in the planning stages, that the seminar report would include a bibliography. When the manuscript was completed and reviewed, the bibliography was not considered appropriate, however, and required an updating of information. The bibliography, therefore, is issued as Part II, and is enlarged to include the resources and references in the combined collections of American University and the AIBS.

5538. Rojo, Alfonso Lucio (539 Richmond St., London, Ontario, Canada). 1959. BIOLOGY, BIOMETRY, ANATOMY AND FISHING OF THE HADDOCK (MELANOGRAMMUS AEGLEFINUS). (BIOLOGÍA, BIOMETRÍA, ANATOMÍA Y PESCA DEL AGELFINO (MELANOGRAMMUS AEGLEFINUS).) Trab. Inst. Espanol Oceanogr. 27. 1-67; Biological Abstracts, Vol. 40, No. 3, Abst. No. 8981. 1962.

The paper deals with the stock of the haddock of the Grand Bank of Newfoundland in relation with those of Europe and North America. Curves for theoretical and actual growth in the different subareas are given. Length frequencies, number of sclerites, vertebral counting, sexuality and maturity, feeding habits, and correlation between the otolith length and weight with the age, are the most important subjects. (Auth.)

5539. Antonovich, S. D. 1960. THE RELATIONSHIP BETWEEN PROTOZOAN FAUNA FORMATION IN THE DUBOSSARSK RESERVOIR AND ITS TRIBUTARIES. (O VZAIMOZAVISIMOSTI FORMIROVANIYA FAUNY PROSTEISHIKH V DUBOSSARSKOM VODOKHRANILISHCHE I EGO PRITOKAKH.) Trudy Inst. Biol. Moldav. Fil. Akad. Nauk SSSR 2(1): 19-24; Referat. Zhur., Biol., 1962, No. 7Zh292; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21885. 1962.

The studies were made in 1958-1959. The tributaries of the Dubossarsk Reservoir belong, on the basis of their biologic indices of water pollution, among the β-meso- and mono- to polycontaminated water bodies. Their influence on the reservoir is slight, since the total yearly flow of the tributaries does not exceed 6% of the whole flow of the reservoir. Seasonal changes in the number of Protozoa in the affluents are characterized by a significant reduction in summer as compared with the amount in spring and autumn.

5540. Bilak, I. I. 1961. THE FOOD RESOURCES (ZOOPLANKTON) OF THE TEREBLYANSKOE RESERVOIR AND OTHER MOUNTAIN WATER BODIES OF THE TEREBLYA RIVER SYSTEM. (KORMOVYE RESURSY (ZOOPLANKTON) TEREBLYANSKOGO VODOKHRANILISHCHA I DRUGIKH GORNYKH VODOEMOV SISTEMY R. TEREBLI.) Doklady i Soobshch. Uzhgorodsk. Gosudarst. Univ. Ser. Biol. 4. 50-54; Referat. Zhur., Biol., 1962, No. 7Zh293; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21887. 1962.

The water bodies studied fully meet the nutritional requirements of the planktophagic fish which inhabit them. They also have the food resources for the acclimatization of a small number of other plankton-eating fish.

5541. Khmeleva, N. N., and L. I. Tsvetskova. 1959. EFFECT OF MINERAL FERTILIZATION OF THE DEVELOPMENT OF PHYTOPLANKTON IN EXPERIMENTAL PONDS OF THE RYBTSOVO NURSERY IN THE SUMMER OF 1953. (VLIYANIE MINERAL'NOGO UDOBRENIYA NA RAZVITIE FITOPLANKTONA V EKSPERIMENTAL'NYKH PRUDAKH RYBTSOVO SHEMAINOGO PITOMNIKA LETOM 1953 G.) Trudy Zool. Inst. Akad. Nauk SSSR 26. 250-256; Referat. Zhur., Biol., No. 3D459; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21892. 1962.

The best development of phytoplankton was observed when mineral fertilizer was added to the water in the form of N and P salts. Complex fertilizers (mineral and plant) had the best effect on cultivated ponds.

5542. Brasch, John (Wisconsin Cons. Dept., Black River Falls), and Willis Fernholz. 1962. STREAM REHABILITATION. Wisconsin Conservation Bull. 27(4): 10-11; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21911. 1962.

Techniques using fish toxicants to eradicate suckers from streams, followed by stocking with desired species of trout.

5543. Haberman, H. 1961. MARKING FISHES IN LAKE VORTSJARV. (KALADE MÄRGISTAMISEST VORTSJÄRVEL.) Eesti Loodus 3. 175-179; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21920. 1962.

In 1951-1958, 2268 fishes were marked in Lake Vortsjärv. Celluloid discs were attached to the backs of the fishes by means of silver wires. It has been shown as a result of the marking that the pike and the perch are relatively localized whereas the bream undertakes comparatively long migrations. A bream marked in 1952 was recovered the following year in the Pedaspää Bay of Lake Peipsi. A perch tagged in the northwestern part of Lake Vortsjärv was caught ten months and ten days later near Jänese railway bridge. This is the longest migration of perch thus far recorded. Marking will be continued in future as the problem of the links between the fish populations of Lake Vortsjärv and Lake Peipsi needs to be solved. The table gives a survey of the marked fishes according to species. The following species are listed in the columns of the table (from top to bottom): perch, eel, northern pike, ruff, pike perch, bream, burbot, white bream, rudd, ide, roach, Aspius aspius. (Auth.)

5544. Hastings, Claude E., and Frank B. Cross (Museum of Nat. Hist., Univ. of Kansas, Lawrence). 1962. FARM PONDS IN DOUGLAS COUNTY, KANSAS, AND THEIR USE IN FISH-PRODUCTION. Univ. of Kansas Mus. Nat. Hist. Misc. Publ. 29. 1-21; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21921. 1962.

There were 1316 farm ponds in Douglas County, Kansas, in 1954. Of these, 89.5% were half an acre or less in size, and only 2.6% had a surface area exceeding 1 acre. Only half of the ponds had been stocked and few of those were fished often. Few farm ponds possess the characteristics required for successful management of diversified sport fish populations. Additional research is needed to determine what spp. of fish would be suitable for the typical small, turbid pool of Douglas County. The requirements for the production of sport fishes are outlined. (A. K. W.)

5545. Hickling, C. F. 1962. TROPICAL INLAND FISHERIES. John Wiley and Sons, Inc., New York 16, N. Y., 287 pp.; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21922. 1962.

The first 5 chapters deal with the general physical and chemical principles governing water productivity; the next 3 consider some biological factors involved. Fishing gear and methods of fishing (individual and multiple capture) are described, as are the most common ways of preserving the catch (drying, smoking, salting, and refrigeration). The rest of the book is devoted to an examination of the various types of freshwater fisheries. The most productive of these are the flood fisheries, the result of the annual overflowing of the rivers. Lake fisheries differ from those in rivers, since they are not subject to strong currents or great seasonal variations of water level. While this makes fishing more difficult, it does give a steadier year round yield. Large parts of deep lakes are rendered unsuitable for fish by deoxygenation. This problem usually does not occur to any great extent in shallow lakes. It is, however, frequent in swamp fisheries, where it may be so severe in some areas that only fish adapted to breathe atmospheric air can survive. An important aspect of fishery development is the stocking of artificial bodies of water like dams, reservoirs, and farm ponds. Some miscellaneous and minor fisheries like rice and sugarcane (during periods of flood-fallow) fields, ditches, and irrigation canals are also discussed. (M. K.)

5546. Isak, H. 1962. SALMON WITH FISH-HOOKS. (LÕHE ÕNGEKONKSUGA.) Eesti Loodus 1. 45-46; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21929. 1962.

The article deals with the investigation of salmon migrations by the "fish-hook method". Namely, some salmon that have swallowed baited hooks set in the high seas by fishermen of various countries succeed in escaping after biting through or tearing the line. Fish hooks produced by several well-known factories have been discovered in the mouths of salmon caught off the northern coast of Estonia. Every hook (with its accessories) is of value in that it enables us to draw conclusions regarding the first locality where a fish was caught and its subsequent migrations. (Auth.)

5547. Koeppe, R. (Pedagogical Hochsch., Potsdam, Germany). 1961. THE TOXICOLOGY AND TOXICITY OF TOXAPHENE WITH RESPECT TO FISH AND AQUATIC FOOD ANIMALS. Zeit. Fischerie 9: 771-794; Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 21932. 1962.

All spp. of fish tested proved to be very sensitive to toxaphene (I) in concns. of 0.001-0.05 p. p. m. although carp were somewhat more resistant. I proved to be 10 times as toxic as lindane to the spp. of fish tested. The course of poisoning in fish was characterized by various stages of intoxication with the temps. of the water influencing the duration of the course of poisoning, but not the lethal dose. Fish exposed briefly to the lethal dose of I recovered when placed in I-free water. Normally, fish stopped feeding on I-poisoned food animals after slight damage had occurred, with subsequent recovery. However, fish exposed to sublethal doses of I or weakened by parasites usually died after eating I-poisoned food animals. Food animals were generally resistant to I. (Chemical Abstracts)

5548. Dyk, V. V. 1960. DATA ON THE ECOLOGY OF THYMALLUS IN RIVERS OF THE ZAKARPATSKAYA OBLAST'. (MATERIALY PO EKOLOGII KHARIUSA V REKAKH ZAKARPATSKOI OBLASTI.) Flora i Fauna Karpat., Akad. Nauk SSSR, Moscow, pp. 171-178; Referat. Zhur., Biol., 1961, No. 6D313;

Biological Abstracts, Vol. 40, No. 6, Part 1, Abst. No. 25507. 1962.

Thymallus inhabits the Zakarpatskaya oblast' at altitudes of 1000 m above sea level. The lowest regions of Thymallus distribution are in the River Lyuta, 169 m above sea level.

5549. Houston, Arthur Hillier (Dept. of Zool., Univ. of Manitoba, Winnipeg, Manitoba, Canada). 1962. SOME OBSERVATIONS ON WATER BALANCE IN THE GOLDFISH CARASSIUS AURATUS L., DURING COLD DEATH. Canadian Journal of Zoology, Vol. 40, No. 7, pp. 1169-1174.

Cold death in goldfish acclimated to 20-22° C and abruptly transferred to temperatures of 2.5-3.5° C was accompanied by a decrease in plasma chloride concentration, but no marked change in tissue chloride level. While tissue water content remained relatively steady variations in chloride space indicated a progressive shift of fluids from the cellular to the extracellular phase. Although the data indicate some loss of osmoregulatory control during exposure to low temperatures, the variations noted were not considered to be great enough to have alone accounted for the death of the animals. (Auth.)

5550. Lindsey, C. C. (Inst. of Fish., Univ. of British Columbia, Vancouver, Canada). 1962. OBSERVATIONS ON MERISTIC VARIATION IN NINESPINE STICKLEBACKS, PUNGITIUS PUNGITIUS, REARED AT DIFFERENT TEMPERATURES. Canadian Journal of Zoology, Vol. 40, No. 7, pp. 1237-1247.

Eggs of 10 pairs of wild ninespine sticklebacks from Hobson's Brook near Cambridge, England, were reared under various controlled temperatures. Temperature for optimum survival to hatching differed between genotypes. Ninety young were examined for counts of vertebrae, spines, and dorsal, anal, and pectoral fin rays. Survivors at high temperature had markedly more vertebrae than survivors at low. Curves of temperature against vertebral count may be V-shaped for each genotype, and optimum survival temperature may produce lowest vertebral count. More basal supports to the dorsal and anal fins and spines were produced at high temperature. Disruptions in one-to-one serial conformity between ray or spine, basal, and vertebral series became progressively commoner at higher rearing temperatures. Parents showed positive correlation between dorsal and anal fin ray counts and number of caudal scutes. Comparisons are made with Gasterosteus aculeatus. (Auth.)

5551. Radakov, D. V. 1961. SPECIFIC FEATURES OF THE DEFENSIVE BEHAVIOR OF SCHOOLS OF SOME PELAGIC FISH. (OB OSOBENNOSTYAKH OBORONITEL'NOGO POVEDENIYA STAI NEKOTORYKH PELAGICHESKIKH RYB.) Trudy Inst. Morfol. Zhivotnykh Akad. Nauk SSSR 39. 47-71; Referat. Zhur., Biol., 1962, No. 8150; Biological Abstracts, Vol. 40, No. 1, Abst. No. 338. 1962.

The behavior of fish in schools is one of the most labile adaptations of any species. The school is capable of changing vigorously in different respects, both in space and time. Observations on atherines, anchovies, coalfish, and other fishes confirm and broaden the concept of the protective importance of the school, e. g., daytime predators become disoriented by the very numbers of the victims and by appropriate maneuvers of the school. An "imitation of intimidation" is observed which enables the whole school to escape from danger detected by only a portion of the fish. If the prey becomes accessible only with difficulty, or inaccessible, the active movements of the predator die down; they increase with indications of successful hunting. Behavior when frightened or when caught by a slowly-moving trawl consists of 2 phases: (1) an instant jump; and (2) a general increase in active movements. The reactions of the fish as when frightened fulfill corresponding vital functions with the least expenditure of energy within the limits characteristic for that species.

5552. Baranenkova, A. S. 1961. A METHOD FOR STUDYING THE EARLY STAGES OF COMMERCIALLY VALUABLE FISHES. (K METODIKE ISSLEDOVANIYA RANNIKH STADII PROMYSLOVYKH RYB.) Nauch.-Tekh. Byull. Polyar. Nauch.-Issledovatel i Proekt. Inst. Morsk. Ryb. Khoz. i Okeanogr. 2/3(16/17): 10-13; Referat. Zhur., Biol., 1962, No. 8I1; Biological Abstracts, Vol. 40, No. 1, Abst. No. 390. 1962.

Voyages were made in April and May and also in June and July of 1959 and 1960 to study patterns of distribution of larvae of different species of fishes in the North Atlantic and to establish methods for counting them. It was established that an egg net, consisting of a ring trawl made of stramin and perlon and having 3-mm meshes, can be used to count the larvae of cod in April, May and June. There is as yet no fishing equipment suitable for counting the larger fingerlings of the cod. Since the habitats of the larvae of different species overlap only in part, studies must be made of a considerable area of the sea if a count is to be made. The area for counting the larvae of the red fish should be extended westward to 5° east longitude. The count should be made from April to June.

5553. Cairns, John, Jr., and Arthur Scheier (Acad. Nat. Sci., Philadelphia, Penna.). 1962. THE EFFECTS OF TEMPERATURE AND WATER HARDNESS UPON THE TOXICITY OF NAPHTHENIC ACIDS TO THE COMMON BLUEGILL SUNFISH, LEPOMIS MACROCHIRUS RAF. AND THE POND SNAIL, PHYSA HETEROSTROPHA SAY. Notulae Naturae, 353. 1-12; Biological Abstracts, Vol. 40, No. 1, Abst. No. 394. 1962.

Literature dealing with the toxicity of naphthenic acids is briefly discussed. For fish, the concentration of naphthenic acids which resulted in 50% survival in 96 hours was 5.79 ppm in soft water at 18° C and 5.60 ppm in soft water at 30°; 7.15 ppm in hard water at 18° and 7.10 ppm in hard water at

30°. For snails, the concentration of naphthenic acids which resulted in 50% survival in 96 hours was 6.60 ppm in soft water at 20°, and 15.6 ppm in soft water at 30°; 12.6 ppm in hard water at 20°, and 12.2 ppm in hard water at 30°. (Authors)

5554. Cuerrier, Jean-Paul. 1962. BIOLOGICAL INVENTORY OF THE FISHES AND FISHERIES OF THE LAC SAINT-PIERRE REGION. (INVENTAIRE BIOLOGIQUE DES POISSONS ET DES PECHERIES DE LA REGION DU LAC SAINT-PIERRE.) Nat. Canadien 89(6/7): 193-214; Biological Abstracts, Vol. 40, No. 1, Abst. No. 397. 1962.

After a general discussion of fishing methods employed and quantities of the various fish captured, the author discusses sex ratios, maturity, alimentation, size and growth rate, and migration of the lake sturgeon (Acipenser fulvescens Raf.). The report of Dorosoma cepedianum in Lac Saint-Pierre is a new distributional record. (G. R. B.)

5555. Ehrlich, Stefan. 1962. TWO EXPERIMENTS IN INDUCING NUTRIA AGGREGATION IN UNFENCED ARTIFICIAL PONDS. Hydrobiologia 19(4): 316-333; Biological Abstracts, Vol. 40, No. 1, Abst. No. 400. 1962.

Two experiments with the nutria (Myocastor coypu) were carried out: in the first, animals were released by the experimenters; in the second, a feral population was used. Regular food distribution, provision of shelters and the cutting of channels in the weed beds were used to induce aggregation. In the first experiment aggregation was noted in 2-3 months; in the second not until almost 2 years had passed. Dense colonies were formed as a result of these aggregation tendencies and these tendencies persisted in the colonies. The intensified nutria activity in the area of the colonies resulted in the destruction of coarse pond vegetation in the neighborhood of the colony which was associated with an increase in fish yield in that fish pond. (K. E. M.)

5556. Genovese, Sebastiano (Univ. Messina, Italy). 1960. ON THE ALIMENTARY REGIMEN OF THUNNUS THYNNUS (L.). (SUL REGIME ALIMENTARE DI THUNNUS THYNNUS (L.).) Boll. Pesca, Piscicol. e Idrobiol. 15(2): 177-189; Biological Abstracts, Vol. 40, No. 1, Abst. No. 403. 1962.

A report on the investigations of the stomach contents and alimentary regimen of tuna carried on, since 1950, in some madragues in Sicily, Calabria, and Straits of Messina. Tunny, when they are in the full sexual maturity, refuse food, and progressively acquire their capacity of feeding in relation to the fractional delivery of their sexual products. Between breeding seasons the tunny is an active predator, and its nourishment is mainly formed by fishes. Young tunny, which are growing up, show a remarkable need of food and, therefore, their stomach contents are relatively bigger than in adult tunny. (Auth.)

5557. Khoroshko, P. N. 1961. EFFICIENT USE OF THE STOCKS OF FISH FOOD IN THE VOLGA. (O RATSIONAL'NOM ISPOL'ZOVANII KORMOVYKH ZAPASOV VOLGI.) Rybnoe Khoz. 4. 22-23; Referat. Zhur., Biol., 1961, No. 8I62; Biological Abstracts, Vol. 40, No. 1, Abst. No. 409. 1962.

In the fall of 1958 the completion of the Volgograd dam barred the access of migratory fishes to their spawning grounds. No changes in the species composition of the food stocks occurred. The biomass of zooplankton increased from 296.7 to 546 mg/m^3 and its maximum occurred a month earlier. The benthic biomass increased from 0.4 to 1.4 g/m^3; greatest development was shown by the gammarids. The young of the acipenserids have always migrated to the Volga delta when they go over to active feeding. A hatchery for acipenserids must be built in the area of Volgograd, and a point for releasing 5 to 8-day-old acipenserid larvae should be constructed just below the dam.

5558. Kondrat'ev, V. P. 1961. USE OF RADIOACTIVE ISOTOPES IN COMMERCIAL FISHING. (PRIMENYAT' RADIOAKTIVNYE IZOTOPY V PROMYSHLENNOM RYBOLOVSTVE.) Rybnoe Khoz. 5. 62-64; Referat. Zhur., Biol., 1962, No. 6I10; Biological Abstracts, Vol. 40, No. 1, Abst. No. 411. 1962.

In using a radioactive marking method, the fish are placed for several hours in water containing a weak concentration of radioactive substances. Isotopes of elements present in the body of a fish can be used as radioactive markers. Most suitable are P^{32} and Ca^{45}. Both persist well in the body of a fish, and are safest to use in mass marking. The marked fish in a catch were counted by passing them through a radiometrically equipped tank. The process of radioactive marking of fish can be used in tests of fishing tackle efficiency, and in studies of various phases of the biology of fishes.

5559. Konstantinov, K. G. 1961. MARKING BENTHIC FISHES IN THE BARENTS SEA (SUPPLEMENTED TEXT OF A REPORT READ AT A JOINT MEETING OF SOVIET AND NORWEGIAN SCIENTISTS IN AUGUST, 1958.). (MECHENIE DONNYKH RYB V BARENTSEVOM MORE (DOPOLNENNYI TEKST DOKLADA, PROCHITANNOGO NA SOVMESTNOM SOVESHCHANII SOVETSKIKH I NORVEZHSKIKH UCHENYKH V AVGUSTE 1958 G.).) Voprosy Ikhtiol. 1(2): 275-280; Referat. Zhur., Biol., 1962, No. 8I48; Biological Abstracts, Vol. 40, No. 1, Abst. No. 412. 1962.

Starting in 1934 the Arctic Scientific Research Institute for Fisheries and Oceanography has tagged 386,877 individual fishes. Percentage of recapture is 1.4%. The result has been the establishment of the seasonal migrations of the cod and the haddock, the speed of migration, features of the behavior of cod in schools, and the existence of two separate stocks of cod in the Barents Sea. It has also been made clear that Anarhichas minor also makes a seasonal migration, possibly for spawning.

5560. Lebedev, V. D. 1961. ACCLIMATIZING

ACIPENSERIDS FROM SIBERIA AND THE FAR EAST IN EASTERN EUROPEAN WATERS. (O VSELENII OSETROVYKH SIBIRI I DAL'NEGO VOSTOKA V VODEOMY EVROPY.) Rybnoe Khoz. 10. 11-14; Referat. Zhur., Biol., 1962, No. 8I89; Biological Abstracts, Vol. 40, No. 1, Abst. No. 415. 1962.

It is suggested that the acipenserids of Siberia and the Far East, which consist mostly of forms living in lakes and rivers, be acclimatized in the waters of the European part of the USSR. The Siberian sturgeon (Acipenser baeri Brandt) may be acclimatized in the Pechora, Mezen', and Northern Dvina Rivers, and also in Lakes Ladoga, Onega, and others. The Sakhalin sturgeon may be acclimatized to the shores of the Kola Peninsula, and the Amur sturgeon and Huso dauricus to the lower reaches of the Volga, Don, and Dnieper Rivers.

5561. Nikol'skii, G. V. 1961. THE CAUSE OF FLUCTUATIONS IN THE SIZE OF FISH POPULATIONS. (O PRICHINAKH FLYUKTUATSII CHISLENNOSTI RYB.) Voprosy Ikhtiol. 1(4): 659-665; Referat. Zhur., Biol., 1962, No. 8I28; Biological Abstracts, Vol. 40, No. 1, Abst. No. 422. 1962.

Variations in the relative sizes of populations of the generations born in different years (fluctuations) are usually strongly developed in planktonivorous fish and pelagic predators. The fluctuations are an adaptation developed in fish living under conditions in which there is a variable supply of food. The productivity of a generation is determined to a considerable degree by the conditions under which the parents were fattened: that is, the number and quality of eggs laid. In fishes undergoing pronounced fluctuations, the eggs contain little fat and even when the young are at the stage of subsisting on a mixed diet they cannot live long without food from an external source. The supply of yolk in the egg depends on how the parents were fattened. In comparing the number of individuals which were spawned and the number of young resulting, one must consider the quality of the eggs laid and the conditions under which the young developed.

5562. Pinskii, F. Ya. 1962. THE DAILY FEEDING RHYTHM OF SALMON FRY (SALMO SALAR L.). (O SUTOCHNOM RITME PITANIYA SEGOLETOK LOSOSYA (SALMO SALAR L.).) Byull. Moskov. Obshchestva Ispytatelei Prirody Otdel. Biol. 67(1): 152; Biological Abstracts, Vol. 40, No. 1, Abst. No. 424. 1962.

Studies made by catching salmon fry from a pond every 4 hours showed 2 feeding maxima per day: 4-8 a.m. and 4-8 p.m.; the amount consumed at 6 a.m. was 1.5 times that at 6 p.m. Fish with empty stomachs were caught mostly at night. Food consisted of (1) the larvae of Chironomidae (Cricotopus silvestris, Psectrocladius psilopterus, Tanutarsus lobatifrons); (2) Cladocera (Alona spp.) and copepods; (3) larvae of Trichoptera, Ephemeroptera, Coleoptera; (4) Aselus aquaticus. More larvae were eaten during the day, probably because the larvae are more active--and accessible to fish--at that time; more Cladocera, copepods, and oligochaetes were eaten at night. (C. C. S., Jr.)

5563. Smirnov, A. I. 1962. SOME BIOLOGICAL AND PRACTICAL CONCLUSIONS FROM OUR EXPERIENCE IN ACCLIMATIZING PACIFIC SALMON. (NEKOTORYE BIOLOGICHESKIE I PRAKTICHESKIE VYVODY IZ OPYTA AKKLIMATIZATSII TIKHOOKEAN SKIKH LOSOSEI.) Byull. Moskov. Obshchestva Ispytatelei Prirody Otdel. Biol. 67(1): 149-151; Biological Abstracts, Vol. 40, No. 1, Abst. No. 434. 1962.

All spp. of Oncorhynchus have been tested for acclimatization--successfully in freshwater ponds in Japan and in New Zealand waters, unsuccessfully in U. S. rivers draining into the Atlantic. Attempts in the USSR are beginning to show success in acclimatizing pink salmon (Oncorhynchus gorbuscha) in rivers draining into the Barents Sea, the Arctic Ocean, and adjoining areas: in 1960, 80,000 (0.5%) of the young humpbacks planted in 1959 returned to their rivers to spawn. This beginning success has been helped by careful selection of climatically and nutritionally suitable watersheds, use of eggs from stocks of fish which originally migrated only short distances upstream, planting eggs at a very early stage to allow a longer period for acclimatization, and providing extra food for the young. Because humpback fingerlings migrate to the sea during dark nights, the very long Arctic summer day acts as a barrier which is overcome by delaying migration until the fish are bigger and have laid down scales. Other very broad possibilities for transplanting fish are mentioned, including chinook and sockeye in the streams of Sakhalin, the Soviet Asian coast, and the Amur Basin. (C. C. S., Jr.)

5564. Anonymous. 1962. ACTIVITIES OF THE SECTION ON HYDROBIOLOGY AND ICHTHYOLOGY OF THE MOSCOW NATURALISTS' SOCIETY IN THE LAST HALF OF 1960. (DEYATEL'NOST' SEKTSII GIDROBIOLOGII I IKHTIOLOGII MOIP ZA VTORUYU POLOVINU 1960 G.) Byull. Moskov. Obshchestva Ispytatelei Prirody Otdel. Biol. 67(1): 147-148; Biological Abstracts, Vol. 40, No. 1, Abst. No. 444. 1962.

Among the papers given were "Some biological and practical conclusions from experience in acclimatizing the Pacific salmon" by A. I. Smirnov; "The filtering role of higher aquatic plants in the self-purification of the Moscow river" by K. A. Kokin; "Some data on the migration of radioactive strontium and cesium in bodies of water with slow currents" by A. L. Agre and B. M. Agafonova; "The daily feeding rhythm of yearling salmon grown in ponds" by F. Ya. Pinskii; "The cyclomorphosis of Cladocera as a species adaptive characteristic" by E. F. Manuilova; "The malacology of the Caspian Sea and its zoogeographical connections" by Ya. I. Starobogatov and B. M. Logvinenko; "The action of different concentrations of Sr^{90}— Y^{90} on the roe of the anchovy and the ruff" by G. G. Polikarpov and V. N. Ivanov; "The effect of biomycin and

penicillin on the vital activities of some algae" by V. K. Yakovlev; "Some questions of the taxonomy and phylogeny of the lower Teleostei" by B. M. Mednikov; and "The chronic effect of increased concentrations of uranium on the fertility and survival of Lebistes reticulatus" by M. M. Telitchenko.

5565. Lund, William Albert, Jr. (Inst. Oceanogr., Cumana, Venezuela). 1961. A RACIAL INVESTIGATION OF THE BLUEFISH, POMATOMUS SALTATRIX (LINNAEUS) OF THE ATLANTIC COAST OF NORTH AMERICA. Bol. Inst. Oceanogr. 1(1): 73-129; Biological Abstracts, Vol. 40, No. 1, Abst. No. 4214. 1962.

Meristic characters from samples of the bluefish collected on the Atlantic coast of North America were studied in an attempt to determine whether races exist. The characters examined were: the number of soft rays in the anal, left pectoral, and second dorsal fins; the number of scales in the lateral line, and the number of gill rakers on the first left branchial arch. Three potential sources of variation were investigated before comparisons were made on a geographical basis. Variation in the method of counting was examined and was found to exist only for lateral line scale counts; however, an F test yielded a nonsignificant value. Variation between sexes was not present in the five characters studied. Variation between year classes collected in the same locality existed only in lateral line scale counts. No differences of biological significance were found in the number of soft rays in the anal, left pectoral, and second dorsal fins in samples collected from Massachusetts to Florida. The number of gill rakers on the first branchial arch was the only character of diagnostic importance. The number of gill rakers was found to be negatively correlated with the length of the fish. An exponential relation was assumed and the dependent variable was transformed to logarithms so that linear computing methods could be used. The data were examined in an analysis of covariance. The differences found in gill raker counts are believed to be primarily of genetic origin. On the basis of gill raker counts there appear to be six races of bluefish along the Atlantic coast of North America. These races, denoted by the geographical area in which they are found during the warmer months are: (1) Massachusetts, Connecticut, Rhode Island, New York; (2) New Jersey; (3) Delaware; (4) Chesapeake Bay to Cape Lookout, North Carolina; (5) Cape Lookout, North Carolina, to perhaps Georgia; and (6) Florida. Commercial fishery catch statistics and the presence of a suitable offshore winter environment are used to support the view that races of bluefish do exist. It is hypothesized that coastal currents may be the isolating mechanism responsible for race formation. A sample of bluefish collected in the Mediterranean Sea in Haifa Bay, Israel, was found to be quite different from their North American relatives in all characters studied. (Auth.)

5566. Savvaitova, K. A. 1961. INTRASPECIFIC BIOLOGICAL FORMS OF SALVELINUS ALPINUS L. IN KAMCHATKA. (O VNUTRIVIDOVYKH BIOLOGICHESKIKH FORMAKH SALVELINUS ALPINUS (L.) KAMCHATKI.) Voprosy Ikhtiol. 1(4): 695-706; Referat. Zhur., Biol., 1962, No. 818; Biological Abstracts, Vol. 40, No. 1, Abst. No. 4222. 1962.

S. alpinus is a polymorphic sp. On the Kamchatka Peninsula it is represented by a transitional form which undertakes annual migrations in the sea and feeds in fresh water on the aquatic and aerial larvae of insects, a form found in lakes and rivers which does not enter the sea and which eats mostly mollusks, and a limnetic form, which does not enter the rivers and which feeds on the stickleback. Differences in the nutrition and manner of living are manifested in specific morphological features of the forms of the char. The differences between forms is observed in characteristics related to the movements of the fish (length of the head, distribution and length of the fins, the number of vertebrae, and the scales along the lateral line), and to their nutrition (gill rakers, pyloric appendages, length of the intestine). The tendency to transgress on the distinctive characteristics and the similarity in the basic meristic and plastic characteristics keep us from separating these forms into independent taxonomic categories: they are all biological forms of S. alpinus.

5567. Savvaitova, K. A. 1961. THE TAXONOMIC STATUS OF KAMCHATKA CHARS OF THE GENUS SALVELINUS. (O SISTEMATICHESKOM POLOZHENII KAMCHATSKIKH GOL'TSOV RODA SALVELINUS.) Zool. Zhur. 40(11): 1696-1703; Referat. Zhur., Biol., 1962, No. 817; Biological Abstracts, Vol. 40, No. 1, Abst. No. 4223. 1962.

Two spp. of chars live in Kamchatka waters: S. leucomaenis and S. alpinus. S. malma (Walb.), described for the Pacific Ocean province of the Holarctic region, is a synonym for S. alpinus. Evidence of this synonymy is provided by data from a morphometric analysis and by the specific biological characteristics. It is likely that the previously described spp. of chars of Siberia and the Far East are synonyms of S. alpinus.

5568. Zaks, M. G., and M. M. Sokolova. 1961. IMMUNOSEROLOGICAL DIFFERENCES BETWEEN INDIVIDUAL SCHOOLS OF BLUEBACK SALMON. (IMMUNO-SEROLOGICHESKIE RAZLICHIYA MEZHDU OTDEL'NYMI STADAMI NERKI.) Voprosy Ikhtiol. 1(4): 707-715; Referat. Zhur., Biol., 1962, No. 819; Biological Abstracts, Vol. 40, No. 1, Abst. No. 4230. 1962.

A study was made by the precipitation reaction of the immunoserological differences between adult specimens of 4 separate schools of Kamchatka bluebacks, 2 from Dal'noe Lake (one of which spawns in June and the beginning of July, the other at the end of July and the beginning of August), one from Blizhnoe Lake, and one from the Paratunka River. An antisera to the plasma and muscle antigens was obtained. Precipitation was produced in test tubes and on agar. It was established that the precipitation

reaction is suitable for distinguishing local schools of bluebacks, since at low concentrations of sera the effect of antigens common for the species disappears and there is appearance only of the effect of "intra-specific" antigens which are characteristic for each school. (Authors)

5569. Shaw, Evelyn (Amer. Mus. Nat. Hist., New York, N. Y.). 1962. THE SCHOOLING OF FISHES. Sci. Amer. 206(6): 128-138; Biological Abstracts, Vol. 40, No. 1, Abst. No. 67. 1962.

The schooling behavior of fishes was studied by observing young developing fishes in a special donut-shaped laboratory aquarium. Schooling unfolds gradually in characteristic patterns of fish-to-fish approach and orientation; initially from the interaction of two tiny fish. As fry grow they interact more and at specific lengths form schools. Fish reared in isolation will school very quickly. Evidence indicates that visual attraction develops parallel with the emergence of schooling behavior. Fish that cannot see will not school. Movement is more important than color and species in mutual attraction. Further orientation in the school may be facilitated by information about the movements of nearby fish, picked up by the nerves of the lateral line. Although many species converged on schooling by diverse evolutionary pathways, the advantage of schooling is not clear. Fish grow more rapidly when they socially feed, and schooling may favor reproduction. (H. D. F.)

5570. Shpet, G. I. 1961. SCALE REGENERATION IN THE TWO-YEAR-OLD MIRROR CARP (CYPRINUS CARPIO L.) SUBJECTED TO IRRITATION. (NOVOOBRAZOVANIE CHESHUI U DVUKHLETNEGO ZERKAL'NOGO KARPA (CYPRINUS CARPIO L.) POD VLIYANIEM RAZDRAZHENIYA.) Voprosy Ikhtiol. 1(3): 421; Referat. Zhur., Biol., 1962, No. 4I6; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 23816. 1962.

The heads of the carp were marked with hot metal. When caught in the autumn, the carp weighed 500-700 g. The brands were plainly perceptible and had widened out, but retained their initial form. In some regions of the burnt skin, the formation of numerous fine scales of various sizes was noted. Under the influence of severe irritation, then, the skin, even in the 2nd year of life, reacts by developing a protective scale covering.

5571. Janković, Mirjana (Sta. for Improvement of Serbian Fish. Conditions, Belgrade, Yugoslavia). 1959. MANIFESTATIONS OF TURBID CURRENTS IN THE GROSNIC ACCUMULATION AND THEIR SIGNIFICANCE WITH REGARD TO THE LAKE'S PRODUCTION PROCESS. (POJAVA MUTNIH STRUJA U GROSNICKOJ AKUMULACIJI I NJIHOV ZNACAJ ZA PRODUKCIONE PROCESE JEZERA.) Arhiv Biol. Nauka 11(1/4): 77-85; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21776. 1962.

No strong and regular laminary currents appear in the Grosnica Dam, except in unusual cases. However, in summer or autumn the Grosnica River can become overloaded with suspended material after heavy rains. Its density is greater than any lake layer, and it appears in the lower hypolimnion in the form of a turbid current, disturbing the temperature-depth relationship which is characteristic for summer stagnation. Instead of water temperature decreasing progressively with depth, layers with successively lower temperatures arrange themselves between the warm upper and lower water masses, and at 6 m the temperature reaches a minimum. This minimum may be shifted to a greater depth when the lower warm layer gradually rises. Because of the geological composition of the substratum and the surface, conditions in the river area are favorable for erosion of soil. After every heavy rain huge quantities of suspended alluvium are washed into the lake. The entire lake can become turbid from the combined action of methane bubbles and turbulent mixtures of warm and cold river water with the upper cold and dense lake layers. Because of the high turbidity of the water, photosynthetic activity of green algae is decreased and the production of phytoplankton and zooplankton is reduced. Results from quantitative investigations on the number of zooplankton are reported. The production of bottom fauna is relatively small, the values obtained not exceeding those of mesotrophic lakes although the sp. Chironomus plumosus, the faunistic indicator of eutrophic waters, is represented in large quantities. The filling up of the lake can also have a positive effect on the bottom fauna. By means of turbid currents, lake sediment is enriched with detritus and bacteria. These are the basic food for Oligochoetes and Chironomidae, the most numerously represented members of bottom fauna in Grosnica Lake. Because of the relatively rapid mineralization of organic material under the effect of increased temperature in the hypolimnion, organic material is available to bottom fauna for only a short time. Its value does not exceed 10%. Increased filling in of Grosnica Lake, which is produced by the appearance of turbid streams, has a 2-fold action on its production process. Because of the high turbidity of the water, the normal photosynthesis of autotrophic plants and increase in organic production is prevented. On the other hand, a constant excess of organic and inorganic substances assures a basis for the renewed production of organic material. (Auth.)

5572. Sladeckova, Alena (Dept. Water Technol., Trojanova, Praha, Czechoslovakia). 1962. LIMNOLOGICAL INVESTIGATION METHODS FOR THE PERIPHYTON (AUFWUCHS) COMMUNITY. Bot. Rev. 28(2): 286-350; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21786. 1962.

There is no English equivalent of the German term "Aufwuchs", i. e. the community of attached aquatic organisms. Therefore, the nearest term "periphyton" is used. The field and laboratory methods for the evaluation of this community are summarized and qualitative as well as quantitative methods are described. The numerical quantitative methods have to be preferred because of their

accuracy and adequacy for natural conditions. On the other hand the quantitative mass methods are easier and more convenient for the routine work. The determination of abundance by counting or estimating have to be considered only as supplementary quantitative methods. Methods for the periphyton growing on natural substrata were treated separately from those for artificial substrata. Several new methods, modifications and devices designed and proved by the reviewer were described and figured. Special attention was paid to the glass slide method, to the position of exposed substrata, the duration of exposure and to the collection and transport of samples. The survey of methods is supplemented by 40 figures and 451 references. (Auth.)

5573. Belyi, N. D. 1961. THE REPRODUCTION OF FISH IN ARTIFICIAL NESTS IN THE KAKHOVSK RESERVOIR. (RAZMNOZHENIE RYB NA ISKUSSTVENNYKH GNEZDAKH V KAKHOVSKOM VODOKHRANILISHCHE.) Rybnoe Khoz. 6. 25-27; Referat. Zhur., Biol., 1962, No. 2I67; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21797. 1962.

Spawning of the zander always begins earlier at the tops of gravel mounds, where the water is more quickly warmed. Fish-raising points should be distributed in reservoirs primarily on mounds where a larger number of roe may be produced.

5574. Belyi, N. D. 1961. REPRODUCTION IN THE ROACH RUTILUS RUTILUS HECKELI (NORDMANN) IN THE LOWER REACHES OF THE DNEPR RIVER IN ARTIFICIAL NESTS. (RAZMNOZHENIE TARANI RUTILUS RUTILUS HECKELI (NORDMANN) V NIZOV'YAKH DNEPRA NA ISKUSSTVENNYKH GNEZDAKH.) Voprosy Ikhtiol. 1(3): 481-490; Referat. Zhur., Biol., 1962, No. 4I43; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21798. 1962.

Observations and experiments are reported which indicate the expediency of using artificial nests and reveal their advantages as against natural egg-laying areas. The high concentration of eggs in a single nest and the low egg loss (5-8%) in the process of development make it possible to incubate the eggs successfully and obtain larvae in massive numbers.

5575. Fuks, V. R. 1960. THE EFFECT OF INTERNAL TIDAL WAVES ON THE DAILY VERTICAL MIGRATION OF COMMERCIAL FISH. (VLIYANIE VNUTRENNIKH PRILIVNYKH VOLNA NA SUTOCHNYE VERTIKAL'NYE MIGRATSII MORSKIKH PROMYSLOVYKH RYB.) Izvest. Tikhookeanskogo Nauch. Inst. Rybnogo Khoziastva i Okeanogr. 46: 189-196; Referat. Zhur., Biol., 1962, No. 2I43; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21803. 1962.

Under the influence of internal tidal waves there are periodic daily changes of temperature, salinity, etc. This causes daily vertical migrations of a number of pelagic fish. Vertical tidal migrations are superimposed on the daily migration of food toward the light and sometimes even predominate over it. Thus, astronomical conditions, the size of the vertical gradient of the hydrological characteristics, and the type of stratification determining the dimensions of the internal tidal wave determine also, at least in part, the size of the catch of pelagic fish. Consideration of the effect of the internal tidal waves in the fishing areas will make it possible to determine the depth of large-scale concentrations of fish at different times of day.

5576. Lie, Ulf (Inst. Mar. Res., Bergen, Norway). 1961. ON THE GROWTH AND FOOD OF O-GROUP COALFISH, POLLACHIUS VIRENS (L.), IN NORWEGIAN WATERS. Sarsia 3. 1-36; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21815. 1962.

Coalfish, Pollachius virens (L.), of the O-group have been collected in North and West Norwegian waters for a study of growth and food. The growth rate was higher in western Norway than in northern Norway, but no decrease in the growth rate with increasing latitude was found for O-group coalfish from the stations in northern Norway. Measurements from the Sunnhordland-Hardanger area indicated a higher growth rate in the inner part of the area. A diurnal variation in the mean length of O-group coalfish occurred in catches from Håkonsund near Bergen. The degree of fullness of the stomachs has been estimated. Copepods were the main food item, with Harpacticoida dominating at the northernmost stations, Calanoida at the others. In Håkonsund the number of larger food organisms was increasing throughout the autumn. The abundance of the different species in the stomach contents is discussed. (Auth.)

5577. Lyubimova, T. G. 1961. MECHANISMS GOVERNING THE DISTRIBUTION OF BONITO IN THE BLACK SEA. (ZAKONOMERNOSTI RASPREDELENIYA PELAMIDY V CHERNOM MORE.) Rybnoe Khoz. 8. 10-13; Referat. Zhur., Biol., 1962, No. 4I52; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21816. 1962.

The bonito Sarda sarda enters the Black Sea in the spring-summer period. In spring, at a surface water temperature of 15-18° C, aggregations of bonito move rapidly northwest, northeast and east. The fish migrates in the open sea, but if the temperature of the coastal waters is sufficiently high, it is also observed close to the shores. The bonito spawns in June in the eastern and western parts of the sea, avoiding regions cooled by the discharge of large rivers. The summer distribution depends upon the temperature of the surface layer and the distribution of food objects--horsemackeral (Trachurus) and anchovy (Engraulis). Periodically, the bonito approaches the shores of the Krym and Caucasus, where it feeds until August. In the autumn, the bonito schools leave for the south.

5578. Marti, Yu. Yu. 1961. THE SUPPLY OF MATURE ARCTIC COD. (SOSTOYANIE ZAPASA VZROSLOI ARKTICHESKOI TRESKI.) Rybnoe Khoz.

7. 7-9; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21818. 1962.

The catch of mature cod was lower in 1960 than in the year before. An analysis of the catch in Norwegian waters by sizes showed that there has been no substantial change recently in the time at which different year-classes begin to appear in the catches. Most of the reproducing males mature in their 8th and 10th year. Most of the 1960 catch consisted of the 1950 year-class. It is believed that the abundant year-classes of 1948, 1949, and 1950 were subjected to much more intensive catching effort than in the pre-war period. Measures for regulating the fishing for cod must be put into effect.

5579. Brooks, Ivan C., and Robert W. Price (S. B. Penick and Co. Res. Lab., Jersey City, N. J.). 1961. STUDIES ON THE CHRONIC TOXICITY OF PRO-NOXFISH, A PROPRIETARY SYNERGIZED ROTENONE FISH TOXICANT. Toxicol. and Appl. Pharmacol. 3(1): 49-56; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 23488. 1962.

A proprietary fish toxicant containing as active ingredients 2.5% rotenone and 2.5% Sulfoxide, was fed to rats in their drinking water, at a level of 100 ppm for a period of 70 weeks. The average weight of the treated animals was less than that of the untreated controls at autopsy. A similar formulation exposed to light and air until no test for rotenone could be obtained, was fed to rats in their drinking water at a level of 100 ppm for a period of 52 weeks. The difference between the average weight of the treated animals and the controls was very slight at autopsy. No gross abnormalities developed in the animals and histopathologic examination of the tissues revealed nothing that could be attributed to the action of either formulation. (Authors)

5580. Bond, Carl E. (Oregon State Univ., Corvallis). 1961. KEYS TO OREGON FRESHWATER FISHES. Oregon Agric. Expt. Sta. Tech. Bull. 58, pp. 3-39; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 25499. 1962.

5581. Caldwell, David K. (Los Angeles County Mus., California). 1962. POSTLARVAE OF THE BLUE MARLIN, MAKAIRA NIGRICANS FROM OFF JAMAICA. Los Angeles County Mus. Contr. Sci. 53. 1-10; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 25500. 1962.

Two small specimens of this fish (201 and 206 mm body length), collected at the surface on 17 September, are described and figured. The characters of dorsal fin outline and snout length, useful in distinguishing adult istiophorids, are shown to be invalid for specimens at least up to this size. (Auth.)

5582. Alvarez, José, Pedro Avila, Graciela Calderón, and Héctor Chapa. 1961. NATURAL RESOURCES OF MEXICO. III. ACTUAL STATUS OF INVESTIGATIONS IN HYDROBIOLOGY AND FISHING. (LOS RECURSOS NATURALES DE MEXICO. III. ESTADO ACTUAL DE LA INVESTIGACIONES DE HIDROBIOLOGIA Y PESCA.) Instituto Mexicano de Recursos Naturales Renovables, Mexico D. F., 421 pp.; Biological Abstracts, Vol. 39, No. 6, Part 1, Abst. No. 21340. 1962.

A review of investigations in various related fields, based on an extensive bibliography of 1831 items. The work is divided into 7 principal sections; the first consists of general works covering the entire field, history, administration and legislation, investigation and teaching. The second, on oceanography, consists of general works, general physical oceanography, pollution, and the "red tide". Section 3, on limnology, consists of general works, hydrological studies, studies of various lakes, works on rivers and studies of coastal lakes. Section 4, on hydrobiology, covers general works, aquatic plants, plankton, various invertebrates, molluscs, crustaceans and fish. Section 5, on fish culture, reviews the history of the industry, studies in marine and continental waters, limnological and fish culture stations, tank culture and spawning. Section 6 on fishing is divided both according to the type of fish and to the different areas: fresh water, Pacific coast, and Gulf coast; also fish industries and sport fishing. The last section is concerned with travels and explorations. (I. K. L.)

5583. Ehlinger, Neil F. (New York Dept. of Cons., Rome). 1963. KIDNEY DISEASE IN LAKE TROUT COMPLICATED BY LYMPHOSARCOMA. Prog. Fish-Cult. 25(1): 3-7.

An outbreak of disease in a lake trout (Salvelinus namaycush) yearling population in a New England hatchery was investigated. Exteriorly, the diseased fish showed a conspicuous swelling in the anal region. Dissection indicated involvement of tail kidney with dense concentrations of bacteria, necrosis, purulent exudate, and an invasion of inflammatory cells into the adjoining musculature. The remaining kidney was firm, somewhat enlarged and pale red or pinkish. Bacteriological and histological studies, as well as an infection experiment, indicated that the tail kidney was infected with kidney disease. Histological studies made of mid-kidney tissue disclosed a neoplasm--lymphosarcoma. (Auth.)

5584. Phillips, Arthur M., Jr., Donald L. Livingston, Hugh A. Poston (U. S. Bur. Sport Fish. and Wildl., Cortland, New York), and Henry A. Booke. 1963. THE EFFECT OF DIET MIXTURE AND CALORIE SOURCE ON GROWTH, MORTALITY, CONVERSION, AND CHEMICAL COMPOSITION OF BROOK TROUT. Prog. Fish-Cult. 25(1): 8-14.

The reduction of the calorie content of a standard trout diet by replacement of fractions of the diet with inert cellulose flour reduced the growth rate of trout. If fish meal was present in the mixture, the replacement of withdrawn calories with corn oil restored the growth rate of the fish, establishing an interchangeability of calorie sources for energy in these diets. After the addition of corn oil to the diet, chemical analyses failed to show a significant

increase in body fat, as compared to the results from the standard diet. A sparing action of the corn oil on the protein of the diet was indicated. The value of fish meal in these hatchery diets was established. (Authors)

5585. Wallis, O. L. (National Park Service, Washington, D. C.). 1963. TROUT STOCKING-FREQUENCY CYCLES AND A DEVICE TO DETERMINE AGE CLASSES OF TROUT PRESENT. Prog. Fish-Cult. 25(1): 15-22.

An important element in managing a recreational fishery is the frequency of stocking. This is determined by various factors, such as the fishing pressures or rates at which the stocked fish are used by anglers; existing fish populations; presence or absence of natural reproduction; and the physical, chemical and biological characteristics of the water. Knowledge of the age classes that can be expected to be present under specific stocking frequency cycles is valuable in evaluating the success of a stocking program. A set of charts and a device known as an age-o-meter are presented as aids in determining the age classes to be expected. The anticipated results from various stocking frequency cycles and the subject of rotational stocking of groups of lakes are discussed. (Auth.)

5586. Workman, G. W., and J. M. Neuhold (Utah State Univ., Logan). 1963. LETHAL CONCENTRATIONS OF TOXAPHENE FOR GOLDFISH, MOSQUITOFISH, AND RAINBOW TROUT, WITH NOTES ON DETOXIFICATION. Prog. Fish-Cult. 25(1): 23-30.

This project was conducted to determine the effect of floating and sinking types of toxaphene in relation to different species of fish and water temperatures and chemistries. The analysis of variance of the mortality of goldfish (Carassius auratus) and mosquitofish (Gambusia affinis) shows that there is a significant difference in the water type used. The same holds true for the fish--water and the water--toxaphene relationships. Where temperature was used as a variable, temperature was significant. The relatively low concentration of toxaphene suggested for eradication work so prolongs the time until death that it is not recommended for use in the lotic environment. Any attempt to increase the concentration to the point that it will kill fish within a desirable time interval limits the economy of its use. (Authors)

5587. Purkett, Charles A., Jr. (Missouri Cons. Comm., Jefferson City). 1963. ARTIFICIAL PROPAGATION OF PADDLEFISH. Prog. Fish-Cult. 25(1): 31-33.

Eggs for artificial propagation of paddlefish, Polyodon spathula (Walbaum), were obtained from fish caught in the Osage River, Missouri. Successfully fertilized, they were hatched in trout egg incubators. The fish were reared through one summer. Severe ice and snow conditions during the following winter caused loss of all but two fish. They averaged 21.2 in. and 15.5 oz. after eleven months in a fertilized warm-water pond. At the age of seventeen months, one of these fish was 35.3 in. long and weighed 6.0 lb. and the other was 34.0 in. long and weighed 5.5 lb. Refinements in hatching and rearing techniques are being studied. (Auth.)

5588. Snow, J. R. (U. S. Bur. Sport Fish. and Wildl., Marion, Alabama). 1963. SIMAZINE AS AN ALGICIDE FOR BASS PONDS. Prog. Fish-Cult. 25(1): 34-36.

Use of Simazine (2-chloro-4,6-bis(ethylamino)-s-triazine) at concentrations of 0.5, 1.0, and 2.0 ppm to control algae in largemouth bass (Micropterus salmoides) spawning and rearing ponds is described. The chemical effectively controlled net algae (Hydrodictyon reticulatum) and apparently had no harmful effect on fry or fingerling bass production. The higher level of application showed a faster kill and decay of treated vegetation than the lower levels. Duration of toxicity for the heaviest rate of application was 85 days. At the lower concentrations the ponds were drained before the duration of the toxic period could be ascertained. Decay of the treated vegetation was slow at prevailing water temperatures, and no difficulty with oxygen depletion was encountered. (Auth.)

5589. Price, Robert W., and Joseph B. Haus (S. B. Penick and Co. Res. Div., Jersey City, New Jersey). 1963. AIDS FOR STREAM RECLAMATION. Prog. Fish-Cult. 25(1): 37-39.

Two aids for stream reclamation are presented: (1) A constant head device for drip stations, to insure uniform rate of delivery; (2) nomographs for rapid calculation of delivery rate and amount of toxicant required. (Authors)

5590. Kincheloe, John W. (U. S. Bur. Sport Fish. and Wildl., Cook, Washington). 1963. THE EFFECT OF THE DISINFECTANT ADDITIVE (ANTI-GERM 77) IN PFIZER POULTRY FORMULA TERRAMYCIN ON THREE SPECIES OF SALMONIDS. Prog. Fish-Cult. 25(1): 40-41.

The disinfectant additive Anti-germ 77 in Pfizer's Terramycin Poultry Formula was tested on 3 species of salmonids to determine the effect on growth, mortality, and apparent health. Data from this experiment indicate no significant inhibition or stimulation of these factors in the species tested. (Auth.)

5591. Elliott, Joseph W. (U. S. Bur. Sport Fish. and Wildl., Longview, Washington). 1963. A SENSITIVE PHOTOMETRIC PROCEDURE FOR DISSOLVED OXYGEN WITH POTENTIAL FIELD APPLICABILITY. Prog. Fish-Cult. 25(1): 42-45.

A photometric procedure for the determination of dissolved oxygen has been developed from the Winkler method. Instead of measuring iodine by titration to determine the dissolved-oxygen content of water, the iodine is transferred to chloroform and determined photometrically. Concentrating the iodine in chloroform increases the sensitivity at low levels of dissolved oxygen. Results are comparable

to those obtained by the Winkler method. (Auth.)

5592. Frey, Paul J. (U. S. Bur. Sport Fish. and Wildl., Marion, Alabama). 1963. A PLANE-TYPE SOIL SAMPLER. Prog. Fish-Cult. 25(1): 46-49.

The design and construction of a sampler that will take the thin, even layer of bottom necessary to determine residual deposits of pesticides in aquatic environments is described.

5593. Snieszko, S. F. (U. S. Bur. Sport Fish. and Wildl., Kearneysville, West Virginia). 1963. TWO FOREIGN PAPERS AND AN EVALUATION OF THE USE OF ANTIBIOTICS TO CONTROL INFECTIOUS DROPSY. Prog. Fish-Cult. 25(1): 50-51.

The results obtained by Schaperclaus and by Volf and Havelka while using antibiotics to control infectious dropsy are summarized. It is pointed out that prophylaxis or treatment with antibiotics should be preceded by bacteriological examination. Infections with both Aeromonas liquefaciens and Pseudomonas fluorescens may be treated with a mixture of chloramphenicol and tetracycline or streptomycin. Even if infectious dropsy of carp and other fishes is caused primarily by a virus infection but followed by mortalities due largely to the secondary bacterial infection, the prophylactic and therapeutic treatment recommended by Schaperclaus and by Volf and Havelka is entirely justified and very effective. (Auth.)

5594. Blackburn, Maurice, Raymond C. Griffiths, Robert W. Holmes, and William H. Thomas (Univ. of California, Scripps Inst. of Oceanogr., La Jolla). 1962. PHYSICAL, CHEMICAL, AND BIOLOGICAL OBSERVATIONS IN THE EASTERN TROPICAL PACIFIC OCEAN: THREE CRUISES TO THE GULF OF TEHUANTEPEC, 1958-59. U. S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 420, 170 pp.

This report lists the results obtained on the following three cruises in the region of the United States tropical tuna fishery: TO-58-2, October-December 1958; TO-59-1, January-February 1959; and TO-59-2, August-September 1959.

The main objective of these cruises was to compare distribution of ocean properties and features in the Gulf of Tehuantepec, on the Pacific coast of southern Mexico, at different seasons of the year; this investigation was begun in May-June 1958 on cruise TO-58-1 (Expedition SCOT), results of which have already been reported. Observations were made also off the Pacific coast of southern Baja California, thence across the mouth of the Gulf of California and along the coast of southern Mexico towards the Gulf of Tehuantepec, and between the Gulf of Tehuantepec and the thermal anticline off the Costa Rican coast.

Properties measured or computed on all cruises were: temperature, salinity, density, thermosteric anomaly, dynamic height anomaly, dissolved oxygen concentration, inorganic phosphorus concentration, attenuation of diffuse submarine daylight, incident solar radiation, standing crop of chlorophyll a, standing crop of zooplankton, standing crop of micronekton, primary production rate, and surface current direction and velocity (by GEK).

Data on primary production rate and total phosphorus concentration for cruise TO-58-1 (SCOT) are given in appendices. (Authors)

5595. Winberg, G. G. 1961. PRIMARY PRODUCTION OF PLANKTON IN LAKES STUDIED USING THREE METHODS: OXYGEN, RADIOACTIVE CARBON AND CHLOROPHYLL. Verh. int. Ver. Limnol. 1959, 14, 109-112; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 862. 1962.

Data are presented and discussed on the primary production of plankton in 3 lakes of different types in the U. S. S. R., namely lakes Batorine (eutrophic), Narotch (mesotrophic), and Miastro (of intermediate type). In general, there was good agreement between the results obtained by the radioactive carbon and the oxygen methods. Simultaneously, observations were made on the concentration of chlorophyll in the plankton and the relation between photosynthetic activity and chlorophyll concentration was compared with results obtained previously for other lakes.

5596. Goldman, C. R. 1961. PRIMARY PRODUCTIVITY AND LIMITING FACTORS IN BROOKS LAKE, ALASKA. Verh. int. Ver. Limnol. 1959, 14, 120-124; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 863. 1962.

Studies on Brooks Lake, at the base of the Alaska peninsula, included measurements of primary productivity, on the basis of assimilation of carbon, and investigation of nutrient limiting factors, using radioactive carbon techniques. The productivity of the lake increased significantly from the outlet end of the lake towards the major tributary. The nutrient factors which limited photosynthesis showed a progressive change throughout the test period, June-October 1957. In June, corresponding to a peak period of primary productivity, with large populations of Chrysophyta and Chlorophyta, magnesium was the most limiting element. By the middle of July, nitrate had reached a limiting concentration. Phosphorus had beneficial effects throughout the summer, reaching a high level at the middle of August. Bottom sediments contained appreciable quantities of phosphorus, nitrate, and silica and increased the rate of photosynthesis of cultures of lake water. The results are discussed in relation to the volcanic nature of the surrounding watershed.

5597. Jackson, D. F. 1961. COMPARATIVE STUDIES OF PHYTOPLANKTON PHOTOSYNTHESIS IN RELATION TO TOTAL ALKALINITY. Verh. int. Ver. Limnol. 1959, 14, 125-133; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 864. 1962.

The relation between the phytoplankton population and the alkalinity of the water was studied using samples of water and plankton from 12 lakes in New York State, and measuring the photosynthesis of the phytoplankton by measurement of the change in pH value, using a special procedure proposed by J. Verduin. Results are given in tables and graphs.

Of the 4 phyla into which the phytoplankton of these lakes were classified, Cyanophyta showed the highest average rate of photosynthesis and their optimal alkalinity range was 50-110 p. p. m. Pyrrhophyta and Chrysophyta showed similar average rates of photosynthesis, both these phyla being favored by water with less than 50 p. p. m. alkalinity and Pyrrhophyta also by water with an alkalinity above 175 p. p. m. Chlorophyta showed the lowest average photosynthetic rate and for this phylum the photosynthetic rate decreased with increases in alkalinity. Measurements at 15°, 20°, and 25° C showed that the photosynthetic rates of Chlorophyta, Pyrrophyta and Chrysophyta were higher in the colder water whereas that of Cyanophyta was higher in warmer water. It is suggested that the temperature controls primary productivity chiefly by its direct effects on the composition of the phytoplankton communities.

5598. Vollenweider, R. A., and A. Nauwerck. 1961. SOME OBSERVATIONS ON THE C-14 METHOD FOR MEASURING PRIMARY PRODUCTION. Verh. int. Ver. Limnol. 1959, 134-139; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 865. 1962.

Using the tracer method developed by E. S. Nielsen, measurements were made of the primary productivity of lake Erken, Sweden, on the basis of the assimilation of radioactive carbon. The tests, which included both "short-run" and "long-run" series, were designed to elucidate the reliability and limitations of the method, and the results, which are given in tables and graphs, are discussed.

5599. Parsons, J. D., and R. S. Campbell. 1961. METABOLISM OF AN EUTROPHIC RESERVOIR. Verh. int. Ver. Limnol. 1959, 14, 613-618; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 867. 1962.

Physical and chemical observations were made on the eutrophic Ashland Lake, Missouri, in the period August 1952-August 1953, and the effective net primary production was calculated by different methods, giving a mean value of 40.1 g of carbon per m^2 per month, corresponding to a utilization of potential carbon of 82.5 percent, and a bioactivity of 73.2 g of carbon per m^2 per month. From the results obtained, it was concluded that the method of W. Ohle for calculating the net primary production on the basis of the carbon dioxide accumulation-oxygen deficit can be used successfully in eutrophic reservoirs provided that the outflow of water is restricted to the epilimnion and the amount of oxidation during winter is sufficient to break down all but the more reduced carbohydrates. On the basis of effective net primary production, this reservoir would be classified as oligotrophic. It is suggested that reservoirs and possibly lakes, could be classified on the basis of bioactivity per year, since, in the reservoir studied, more carbon was released during winter than was fixed during summer.

5600. Edmondson, W. T. 1961. CHANGES IN LAKE WASHINGTON FOLLOWING AN INCREASE IN THE NUTRIENT INCOME. Verh. int. Ver. Limnol. 1959, 14, 167-175; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 871. 1962.

After summarizing recent changes in Lake Washington, including progressive increases in the concentration of nutrients, larger crops of phytoplankton and zooplankton, and other changes indicating increased productivity, the author discusses the concept of nutrient budget in lakes, with particular reference to the income of phosphorus into various lakes in Wisconsin, Denmark, and Switzerland. Tabulated data on these lakes are included. It is concluded that, as a simple numerical basis for the comparison of rates of nutrient supply to lakes from outside sources, a system based on the "potential concentration" (and therefore on the volume of the lake) has advantages over a system which relates the income only to area.

5601. Edmondson, W. T. 1961. SECONDARY PRODUCTION AND DECOMPOSITION. Verh. int. Ver. Limnol. 1959, 14, 316-339; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 872. 1962.

The author reviews and discusses recent advances and the most important problems requiring solution concerning the production of consumer organisms in lakes and the relations between these organisms and the primary producer organisms, dealing chiefly with the plankton but also with the benthos. After a general introduction, individual consideration is given to the consumption and utilization of food by zooplankton, food density and rate of food supply, direct release of nutrients by zooplankton, release of nutrients by sediments, chemical composition of sediments, stratification, turnover, relation between productivity and standing crop, special aspects of the regeneration of nutrients, and organic materials entering from outside the lake. A bibliography is provided.

5602. Westlake, D. F. 1961. AQUATIC MACROPHYTES AND THE OXYGEN BALANCE OF RUNNING WATER. Verh. int. Ver. Limnol. 1959, 14, 449-504; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 875. 1962.

Further details are given of studies on the submerged macrophytic population in a stream conveying effluent from a sewage works in Hertfordshire, where the organisms found indicated a transitional state between α- and β-mesosaprobic conditions. Almost all the weed was Potamogeton pectinatus, with a few shoots of Sparganium simplex and Cladophora sp. Results are tabulated and it is estimated that 1 km of such a stream would contain 15.4 $\pm$ 1.8 metric tons of water weed. The crop of submerged macrophytes was similar to that found in some eutrophic lakes but considerably less than that in a neighboring unpolluted stream. The data obtained have been used to estimate the effects of photosynthesis on the oxygen balance of the stream; and the various other ways in which macrophyte populations can affect the oxygen balance are also discussed.

5603. Allanson, B. R., and J. E. Kerrich. 1961. A STATISTICAL METHOD FOR ESTIMATING THE NUMBER OF ANIMALS FOUND IN FIELD SAMPLES DRAWN FROM POLLUTED RIVERS. Verh. int. Ver. Limnol. 1959, 14, 491-494; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 876. 1962.

In the survey of the Jukskei-Crocodile River system, representative samples of bottom fauna were obtained satisfactorily using nets of bolting silk with 0.288-mm mesh, but the large numbers of organisms in such polluted water made analysis of the samples laborious. The method of analysis was therefore modified by sieving and washing to separate coarse detritus and larger animals and then suspending the remaining sample in water and stirring mechanically before taking a sub-sample (1/8 of the original) for counting. A photograph is included of the sub-sampling apparatus, including a wide-mouthed pipette. The method of statistical analysis of the data is explained. The method has been used successfully on samples taken from marginal vegetation, stony runs, and sandy or muddy bottoms.

5604. Smith, M. W. 1961. BOTTOM FAUNA IN A FERTILIZED NATURAL LAKE AND ITS UTILIZATION BY TROUT (SALVELINUS FONTINALIS) AS FOOD. Verh. int. Ver. Limnol. 1959, 14, 722-726; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 882. 1962.

Observations on the effects of fertilization of Lake Crecy, N. B., in an attempt to improve the production of brook trout were continued throughout the period 1946-1956, the fertilizer (containing phosphorus, nitrogen, and potassium) being applied in June 1946 and June 1951. Sampling of bottom fauna showed that the total quantity of organisms was increased by fertilization, but the effects disappeared after about 5 years. Variations in the predominant forms of bottom fauna are shown graphically. Different organisms responded differently to the changes in the environment and a considerable proportion of the increase in bottom fauna was in the form of organisms that were not directly used by trout as food.

5605. Munro, W. R. 1961. THE EFFECT OF MINERAL FERTILIZERS ON THE GROWTH OF TROUT IN SOME SCOTTISH LOCHS. Verh. int. Ver. Limnol. 1959, 14, 718-721; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 884. 1962.

Further details are given of experiments to determine the effect on fish of fertilization of oligotrophic Scottish lochs with calcium superphosphate or a compound fertilizer containing nitrogen, phosphorus, and potassium. In the more acid lochs, limestone was also added. The results, which are given in figures, show that, in comparison with a control loch, fertilization improved the size of the trout in all the treated lochs, although the time of appearance and the duration of this effect varied in the different lochs. No distinct difference could be observed in the improvement produced by the two types of fertilizer.

5606. Huet, M. (Section d'Hydrobiologie, Station de Recherches, Des Eaux et Forets, Groenendaal, Belgium). 1961. REPRODUCTION AND MIGRATIONS OF COMMON TROUT (SALMO TRUTTA FARIO L.) IN A SALMON STREAM OF THE BELGIAN ARDENNE. Verh. int. Ver. Limnol. 1959, 14, 757-762; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 885. 1962.

In an attempt to obtain further information on the role of small streams in the spawning of migratory fish, and the effects of afforestation with conifers, observations were made of the trout entering and leaving a trout stream, the Ry de Chicheron, a tributory of the Lesse, downstream from its confluence with the Our. The trapping apparatus used is described and shown in a photograph, and results obtained daily in the period October 1957-March 1959 are summarized and discussed. Observations are being continued.

5607. Gieysztor, M. 1961. TEMPERATURES AND CHEMISTRY OF THE LITTORAL ZONE OF LAKES. Verh. int. Ver. Limnol. 1959, 14, 84-86; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 896. 1962.

The author presents and discusses graphical data on the temperature and tabulated data on the oxygen concentration and permanganate oxygen demand of water in the littoral zone of lakes in Poland. The chemical characteristics of a well-developed littoral zone are different from those of the open lake.

5608. Mortimer, C. H. 1961. MOTION IN THERMOCLINES. Verh. int. Ver. Limnol. 1959, 14, 79-83; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 898. 1962.

The author discusses the smaller-scale processes which regulate the larger pattern of flow in stratified lakes and seas, with particular reference to the thermocline region where density and velocity both vary with depth. Regarding the thermocline as a stratified shear layer between two parallel streams of nearly uniform velocity and density, factors influencing the shape and depth of the thermocline are explained, including those factors which lead to the final instability of the overturn.

5609. Greenshields, F. 1961. SOME RECENT AND PROJECTED RESEARCHES IN RESERVOIR DESIGN LIMNOLOGY. Verh. int. Ver. Limnol. 1959, 14, 1102-1104; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 899. 1962.

The author reviews limnological research in progress and planned for the London Metropolitan Water Board in connection with the design and management of reservoirs. Particular attention has been given to the physico-chemical hydrography of reservoirs storing polluted and highly eutrophic river waters in an area where thermal-density-viscosity layering, with anaerobiosis in the hypolimnion and dense growths of Myxophyceae in the

epilimnion, is liable to occur in anticyclonic summers. On a number of occasions catastrophic breakdown of stratification has affected the water supplies and produced public health hazards, and it was therefore considered that no new reservoirs should be so deep that stratification would occur. However, on the basis of limnological studies, it is now considered possible to solve the problem of increasing deficit in water storage capacity by increasing the depth of about 30 existing reservoirs, according to the individual limnological circumstances. Automatic instruments are being developed for the remote measurement of several hydrographic factors, for use in the management of reservoirs. One of these instruments can be used to bring into operation corrective treatments, such as the application of bactericides, on the approach of the catastrophic breakdown of anaerobic layering, or to shut the reservoir out of service and bring into use another source of supply when the water reaches a pre-selected state. For use in future research, 3 limnological observation towers, equipped with instruments for the automatic measurement of data on wind and water characteristics, are being erected out in a reservoir now under construction in the lower Thames Valley. The reservoir may be operated as a passive store or as a sedimentation basin, and is provided with 2 conventional "drowned mushroom" inlets and one inlet equipped with a series of peripherally-placed jets at different levels and angles, to produce a forced vortex to inhibit or break down stratification, thus permitting observations under various limnological conditions.

5610. Tollefson, R. 1961. FISHERIES STATISTICS IN EVALUATING CLAIMS OF POLLUTION. Proc. Amer. Soc. civ. Engrs., 87, SA3, 11-22, Pap. No. 2818; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 1003. 1962.

The author discusses, with specific examples, the use of fisheries statistics in assessing the extent to which discharges of waste waters are responsible for declining or fluctuating fisheries resources.

5611. Wysocka, H. 1961. PERIPHYTON ON GLASS SLIDES AS INDICATOR OF WATER POLLUTION. Verh. int. Ver. Limnol. 1959, 14, 1063-1070; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 1004. 1962.

To determine whether the glass-slide technique previously used in limnological studies of periphyton could be used to evaluate the degree of pollution of water, glass slides were exposed in 3 polluted rivers (Vistula, Jeziorka, and Bialka) and an unpolluted mountain stream (Dunajec) in Poland and the periphyton communities were examined after periods of 3-10 days. The results are tabulated and analyzed and it is concluded that a satisfactory preliminary evaluation of the degree of pollution can be made on the basis of the periphyton collected over a period of a few days. The species of periphyton characteristic of different degrees of pollution are tabulated. The method was used to classify the waters of various rivers in the river basins of the Vistula and Odra and the results are shown diagrammatically on a map.

5612. Pentelow, F. T. K. 1961. FISH, SEWAGE AND SEA OUTFALLS. Paper presented at a meeting of the Institution of Public Health Engineers and the Royal Society of Health, Blackpool, 7 pp.; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 1005. 1962.

The author discusses briefly some effects of discharging sewage at sea, with particular reference to the effect on fish. Observations by various investigators indicate that although discharge of sewage at sea can have short-term harmful effects, these can be avoided if proper care is taken, and in such cases discharge of sewage may have a long-term beneficial effect on fisheries as a result of its nutritive effect.

5613. Lloyd, R. 1961. THE TOXICITY OF AMMONIA TO RAINBOW TROUT (SALMO GAIRDNERII RICHARDSON). Wat. Waste Treatm. J., 8, 278-279; Water Pollution Abstracts, Vol. 35, No. 5, Abst. No. 1006. 1962.

The author describes a simple graphical method for calculating the toxicity of ammoniacal solutions to rainbow trout. Graphs are given illustrating the effect of bicarbonate alkalinity and pH value, temperature, and dissolved oxygen concentration on the threshold concentration of ammonia and from these the threshold concentration of ammonia for any river can be calculated. The difference between predicted and observed results, given in a table, was not more than 12 percent.

5614. Elster, H.-J. 1962. MATERIAL CYCLE AND CLASSIFICATION OF INLAND WATERS AS CENTRAL PROBLEMS OF LIMNOLOGY. Naturwissenschaften, 49, 49-55; Water Pollution Abstracts, Vol. 35, No. 6, Abst. No. 1104. 1962.

The author discusses the range of limnological studies and their relation to other natural sciences, the physical, chemical, and biological cycles in lakes and flowing waters and factors affecting them, difficulties of classification and the advantages and disadvantages of various systems, and the important requirement of further research, both experimentally and by observation.

5615. Stepanek, M. 1961. AUTOMATIC PLANKTON SAMPLING APPARATUS FOR IMPOUNDING RESERVOIRS ('HYDRA'). Verh. int. Ver. Limnol. 1959, 14, 955-957; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1475. 1962.

An illustrated description is given of a mechanical apparatus, known as 'Hydra', for taking net samples of plankton from depths up to 25 m. At one immersion 20 samples of 10 liters each are taken, and are immediately passed through a phosphor-bronze or silk screen and the concentrated 50 liters collected in flasks. Experiences in the use of the apparatus are described.

5616. Albrecht, M.-L. 1961. A COMPARISON OF QUANTITATIVE METHODS FOR INVESTIGATING THE MACROFAUNA OF FLOWING WATERS. Verh. int. Ver. Limnol. 1959, 14, 486-490; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1477. 1962.

The author gives the results of total and individual counts of fauna in samples taken from the Rivers Kirnitzsch and Polenz by three methods, the Surber sampler, the Shovel sampler, and the Schrader method. It is concluded that results are comparable only when the same method is used. Conditions for which the different methods are suitable are discussed.

5617. Selby, J. M., J. R. Wright, B. M. Bowen, and J. H. Edgerton. 1961. A PROPORTIONAL CONTINUOUS RIVER AND STREAM WATER SAMPLER AT GEORGIA NUCLEAR LABORATORIES. Hlth.Phys., 6, 149-151; Nuclear Sci. Abstr., 1962, 16, 1314; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1479. 1962.

To assist in controlling the radioactivity of surface waters in the vicinity of Georgia Nuclear Laboratories, a continuous proportional water sampler has been developed, designed to utilize water power. The sampler, which is built on the water wheel principle, includes an adjustable suction device and a revolution counter. By using a current-measuring apparatus, such as a Gurley meter, and maintaining the sampler at a desired sampling rate, the total number of revolutions and the volume collected can be related to the rate of flow of the river.

5618. Straškraba, M. 1961. THE INFLUENCE OF THE LITTORAL REGION ON THE PRODUCTIVITY OF A POND. Verh. int. Ver. Limnol. 1959, 14, 208-212; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1488. 1962.

The author describes investigations into the primary production and production of zooplankton in the littoral areas of two ponds, and the influence on the productivity and fish life of the pelagic area.

5619. Patalas, K. 1961. WATER MOVEMENTS CAUSED BY WIND AND MORPHOLOGY AS A DETERMINING FACTOR FOR THE INTENSITY OF METABOLISM IN LAKES OF NORTH POLAND. Verh. int. Ver. Limnol. 1959, 14, 59-64; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1508. 1962.

An account is given of some results of investigations over a period of three years, in a large number of Polish lakes, into the effects of wind and the morphology of the lakes on stratification and mixing of the waters and the action of these processes on the concentration of nutrient matter and the intensity of production.

5620. Zavisza, J., and K. Patalas. 1961. SOME REGULARITIES IN THE GROWTH OF FISH IN LIMNOLOGICALLY DIFFERENT LAKES OF NORTH POLAND. Verh. int. Ver. Limnol. 1959, 14, 740-745; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1524. 1962.

The authors describe investigations in lakes of different limnological types into the rate of growth of fish and its possible relation to primary production, fish yield, and the type of lake. Rate of growth appears to be a specific property of each lake.

5621. Olszewski, P. 1961. EXPERIMENT ON DRAWING OFF THE HYPOLIMNIC WATER FROM A LAKE. RESULTS OF THE FIRST EXPERIMENTAL YEAR. Verh. int. Ver. Limnol. 1959, 14, 855-861; Water Pollution Abstracts, Vol. 35, No. 8, Abst. No. 1569. 1962.

After an account of various methods proposed or used for increasing the oxygen content or reducing the extent of the hypolimnion in eutrophic lakes, the author describes a method tried in Lake Kortowo, Poland, in which the surface outflow was cut off and increased flow in the epilimnion was used to force the hypolimnic water out through a pipe. Results during the first year of operation on stratification, oxygen content, and plankton distribution are described.

5622. Gabriel, J. 1960. IMPOUNDING RESERVOIRS ON RIVERS. THEIR SIGNIFICANCE FOR THE DISPOSAL OF SEWAGE AND RELATIONSHIP TO SECONDARY POLLUTION. Československ. hyg., 5, 166-171; Bibliogr. Rev., Inst. Hyg., Prague, 1960, 2, 29; Water Pollution Abstracts, Vol. 35, No. 9, Abst. No. 1727. 1962.

Studies were carried out on the changes in quality of river water after its accumulation in impounding reservoirs. The changes in quality were influenced by the "accumulation factor"; and data on dissolved oxygen, organic substances, 5-day B. O. D., and bacteria and plant counts indicated that the accumulation factor had a favorable effect on water quality. Comparisons of the results of impoundment of polluted river water (River Heilovka) and unpolluted water (Kletec Brook) indicate that effluents discharged to the rivers account for only 30 percent of the pollution, the remaining 70 percent being caused by surface runoff. To improve the quality of water in impounding reservoirs it is therefore considered necessary to eliminate this surface runoff.

5623. Štěrba, O. 1960. FISH MANAGEMENT IN THE WATER-SUPPLY IMPOUNDING RESERVOIR AT KRUŽBERK. Sci. Pap. Inst. chem. Technol., Prague, Fac. Technol. Fuel. Wat., 4, Pt. 1, 477-486; Water Pollution Abstracts, Vol. 35, No. 9, Abst. No. 1729. 1962.

The author describes experiences in the Kružberk impounding reservoir, Czechoslovakia, to which carp and Salmonidae were introduced, and draws conclusions on suitable fish populations for impounding reservoirs.

5624. Anonymous (Ohio River Valley Wat. Sanit. Comm., Cincinnati, Ohio). 1962. AQUATIC-LIFE RESOURCES OF THE OHIO RIVER. Ohio Riv. Valley Wat. Sanit. Comm., 226 pp.; Water Pollution

Abstracts, Vol. 35, No. 9, Abst. No. 1731. 1962.

This report on the aquatic life of the Ohio River includes sections on the history of the fish fauna (including the effects of industrial growth); limnological observations on seven sections of the river; the present fish population; sport fishing; commercial fishing; and taste and odor qualities of the fish. A list of 125 references is provided and other appendices include tabulated, graphical, and diagrammatical data on the species and quantities of fish found, physico-chemical characteristics of the river, phytoplankton, plankton, bacteria, and tastes and odors of the water, including the possible causes. Between Cincinnati and the mouth of the river, there are long stretches relatively free from intense pollution, owing to the distances between large municipal and industrial areas, but in general the river is not very clean and the aquatic life is affected by critically low concentrations of dissolved oxygen, low pH values, excessive concentrations of iron (excessive deposits causing almost complete absence of bottom fauna) and manganese, and low alkalinities, which prevent development of certain aquatic species and also inhibit the migration of other species. Turbidity does not impose any limitations on the aquatic life of this river. Diatoms are the dominant group of phytoplankton, and rotifers and cladocerans the dominant zooplankton. Phytoplankton blooms develop frequently in several parts of the river, usually causing unpalatable tastes and odors in the water. The bottom fauna varies with the type of substratum and the degree of pollution in the river; where considerable amounts of organic matter accumulate on the bottom, as below Cincinnati and Louisville, there is a large population of Chironomids and other invertebrates which can tolerate low oxygen concentrations, whereas in unpolluted areas, there are caddis flies, stone flies, and large beds of clams. The species composition of fish varies throughout the river, and although geological factors have some effect, the principal effects are caused by industrial and other human activity. The fishery has, however, improved in recent years, largely owing to the construction of municipal sewage-treatment plants and the treatment of trade waste waters. As would be expected, the flavor and odor of the fish flesh are most impaired in those areas immediately subject to industrial or municipal pollution, and the upper third of the river and certain zones of the middle third, particularly near Louisville and between Louisville and Cincinnati, are therefore unsuitable for commercial fishing. The lower part of the river is, however, considerably used as a source of table fish.

5625. Neuhold, J. M., and W. F. Sigler (Utah State Univ., Logan). 1962. CHLORIDES AFFECT THE TOXICITY OF FLUORIDES TO RAINBOW TROUT. Science, 135, 732-733; Water Pollution Abstracts, Vol. 35, No. 9, Abst. No. 1867. 1962.

Previous experiments indicated that the toxicity of fluoride to fish was affected by the concentration of chloride in the water, and further experiments have now been carried out to investigate this effect. It was found that acclimatizing rainbow trout to higher chloride concentrations reduced the toxicity of a given concentration of fluoride. It is suggested that the chloride and fluoride excretion systems are either associated or are the same system.

5626. Schmid, O. J., and H. Mann. 1961. ACTION OF A DETERGENT (DODECYLBENZENESULPHONATE) ON THE GILLS OF THE TROUT. Nature, Lond., 192, 675; Water Pollution Abstracts, Vol. 35, No. 9, Abst. No. 1868. 1962.

The effects of the detergent, sodium dodecylbenzenesulphonate, on the gills of trout were examined. Epithelial cells are reduced by 5 mg of detergent per liter, and the respiratory folds of the gill lamina stick together. Higher concentrations of detergent (up to 20 mg per liter), or prolonged treatment with low concentrations cause increased destruction of the epithelium; uptake of oxygen by the gills is then diminished and the mechanisms of salt balance and urea metabolism may also be impaired.

5627. Schiffman, R. H. 1961. THE UPTAKE OF STRONTIUM FROM DIET AND WATER BY RAINBOW TROUT. U. S. Atom. Energ. Comm., HW-72107, 12 pp.; Nuclear Sci. Abstr., 1962, 16, 1539; Water Pollution Abstracts, Vol. 35, No. 9, Abst. No. 1873. 1962.

The results of experiments on the uptake of radioactive strontium from food and water by trout are discussed. In 3 weeks the concentration of strontium-90 in the fish approached about 1.5 times the concentration in the surrounding water. When the isotope was administered in gelatine capsules about 21 percent of the isotope was retained, but retention was only about 7 percent when the isotope was incorporated into natural food. Under the conditions of the experiments, uptake from the water was greater than uptake through the food chain.

5628. Brown, V. M. 1962. THE ACCUMULATION OF STRONTIUM-90 AND YTTRIUM-90 FROM A CONTINUOUSLY FLOWING NATURAL WATER BY EGGS AND ALEVINS OF THE ATLANTIC SALMON AND THE SEA TROUT. U. K. Atom. Energ. Auth., PG-Rep.-288, 16 pp.; Nuclear Sci. Abstr., 16, 1657, 1962; Water Pollution Abstracts, Vol. 35, No. 9, Abst. No. 1874. 1962.

Experiments were carried out on the uptake of strontium-90 and yttrium-90 from water by eggs and young of salmon and trout. At equilibrium, the eggs were 30 times more radioactive than the water, most of the activity being associated with the protective egg membranes. Newly-hatched fish were about twice as radioactive as the water, but rapidly accumulated the two isotopes with growth. The presence of the isotopes in the water did not cause any significant increase in egg mortality.

5629. Ball, R. C. (Dept. of Fish and Wildl.,

Michigan State College, East Lansing), and F. F. Hooper. 1962. TRANSLOCATION OF PHOSPHORUS IN A TROUT STREAM ECOSYSTEM. PROGRESS REPORT, JUNE 14, 1961, TO MARCH 7, 1962. U. S. Atom. Energ. Comm., TID-15385, 48 pp.; Nuclear Sci. Abstr., 1962, 16, 2097; Water Pollution Abstracts, Vol. 35, No. 10, Abst. No. 1932. 1962.

Studies on the movement of radioactive phosphorus through the ecosystem of a cold-water stream in Michigan have been continued. There was considerable difference from year to year in the form in which the added phosphorus-32 was present while in the stream water. Much of the uptake of phosphorus from the water appeared to be by periphyton and by 3 species of macrophytes (Potamogeton, Chara, and Fontinalis); all of these plants had a maximum concentration of phosphorus-32 soon after the spike of radioactivity passed through the area. The rate of loss of phosphorus-32 from the plants to the water was initially high but decreased with time, and the concentration approached an equilibrium level in 15-20 days after the spike was released. Differences in the manner in which the spike circulated through the ecosystem are believed to be largely the result of a difference in distribution of phosphorus-32 between the soluble and particulate phases.

5630. Albrecht, M.-L. 1960. THE ELBE AS A FISHING WATER. Wasserw.-WassTechn., 10, 461-465; LitBer. Wass. Abwass. Luft u. Boden, 1961, 10, 31; Water Pollution Abstracts, Vol. 35, No. 10, Abst. No. 2057. 1962.

The author describes the alterations caused in the amount, types, and condition of fish in the Elbe as a result of pollution and alterations by engineering works, etc. Possible methods of improving the fish population and of reducing pollution are discussed.

5631. Pleasant, R. C. M., M. C. Rand, and N. L. Nemerow. 1962. REPORT ON CHEMICAL AND MICROBIOLOGICAL ASPECTS OF ONEIDA LAKE, NEW YORK. Syracuse Univ. Res. Inst., Dep. civ. Engng Rep. No. 6, 104 pp.; Water Pollution Abstracts, Vol. 35, No. 10, Abst. No. 2058. 1962.

Owing to increasing concern over the apparent fertilization of Oneida Lake, New York, and the problem of over-abundance of algae, a comprehensive survey of the lake was made, with particular reference to the degree, distribution, and sources of pollution, and the relative importance of secondary organic pollution due to algae. Results are given in tables and graphs and discussed. Oneida Lake was found to be similar to eutrophic or highly productive lakes from the point of view of physical characteristics, content of basic nutrients, composition of phytoplankton population, rate of gross production, and degree of productivity; there is little horizontal and vertical variation throughout the lake. Seasonal variations are due almost entirely to environmental factors as they affect biological processes, and not to variations in pollution load. The sources of pollution are the five main influent streams (the Barge Canal, and the Chittenango, Canaserago, Oneida, and Scriba Creeks), shore dwellings, and boat traffic. Although this organic pollution is not excessive, the presence of nutrients, particularly nitrogen and phosphorus, in the polluting discharges enhances the growth of algae to such an extent that the algae contribute about 90 percent of the total organic content, and cause objectionable conditions when deposited on leeward shores and shallows. The shoreward areas also show the effects of local sewage pollution as indicated by increased coliform counts and decreased concentrations of dissolved oxygen. Owing to the importance of algal activity, it is considered that the degree of productivity would be a good way of estimating and comparing the pollutional aspects of this lake. Preliminary investigations, using a chlorophyll extraction procedure which is described, indicate a relation between acetone-soluble chlorophyll and 5-day B. O. D. values. Recommendations are made for further investigations leading to remedial action to reduce the algal population of the lake and alleviate pollution of the shallow shoreward areas.

5632. Bishai, H. M. 1960. THE EFFECT OF GAS CONTENT OF WATER ON LARVAL AND YOUNG FISH. Z. wiss. Zool., 163, No. 1/2, 37-64; Water Pollution Abstracts, Vol. 35, No. 10, Abst. No. 2062. 1962.

After reviewing literature on the effect of the gas content of water (both oxygen and nitrogen) on the survival and distribution of fish, the author reports further investigations using a specially-designed apparatus, which is described and illustrated, giving a continuous flow of water with a known concentration of gas. The test fish (herring, lumpsucker, salmonids, and plaice) included both larval and adult stages. The resistance of fish larvae to low concentrations of oxygen decreased with increase in age; this is explained on the basis of the mode of respiration, degree of activity, and presence of carbohydrates. All the fish survived in water with a high concentration of oxygen (up to 300 percent saturation) with no apparent ill effects provided the total gas pressure did not exceed the hydrostatic pressure. "Gas disease" in herring larvae is attributed to supersaturation of the water with gas; and this phenomenon is discussed in relation to the presence or absence of a swimbladder in the various species of fish.

5633. Henson, E. B., A. S. Bradshaw, and D. C. Chandler. 1961. THE PHYSICAL LIMNOLOGY OF CAYUGA LAKE, NEW YORK. St. Coll. Agric., Mdm. 378, 64 pp.; Water Pollution Abstracts, Vol. 35, No. 11, Abst. No. 2117. 1962.

From 1950 to 1953, studies were made of the physical and chemical characteristics of Cayuga Lake, New York; the results are given in tables and graphs and discussed. The geology and meteorological conditions of the area are described. There

is a period of thermal stratification from May until November and a period of circulation from November to early May; the summer stratification is, however, not stable and is readily modified by internal wave activity. Based on oxygen concentration, the lake is somewhere between oligotrophic and mesotrophic. In summer the surface waters are saturated with oxygen while the deep waters are deficient in oxygen; in winter the oxygen concentration depends on the concentration present at the time of the autumn overturn. The water is alkaline. A bibliography of 109 references is given, including all known references dealing with some aspect of Cayuga Lake or the general Finger Lakes region.

5634. Krishnamoorthi, K. P. 1961. A REVIEW OF SOME ASPECTS OF FISH MORTALITY. Bull. centr. publ. Hlth. Engng. Res. Inst., Nagpur, 3, No. 4, 31-36; Water Pollution Abstracts, Vol. 35, No. 11, Abst. No. 2219. 1962.

The author reviews aspects which should be considered in investigating fish mortalities, including environment, effect of low oxygen concentrations, factors affecting the toxicity of industrial wastes to fish, and the use of pathological procedures in conjunction with biological studies and bioassays for diagnosing cause of death.

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ABSTRACTERS OTHER THAN AUTHORS:

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Created in 1849, the Department of the Interior--America's Department of Natural Resources--is concerned with the management, conservation, and development of the Nation's water, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

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FISH
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